NOVEMBER 1991
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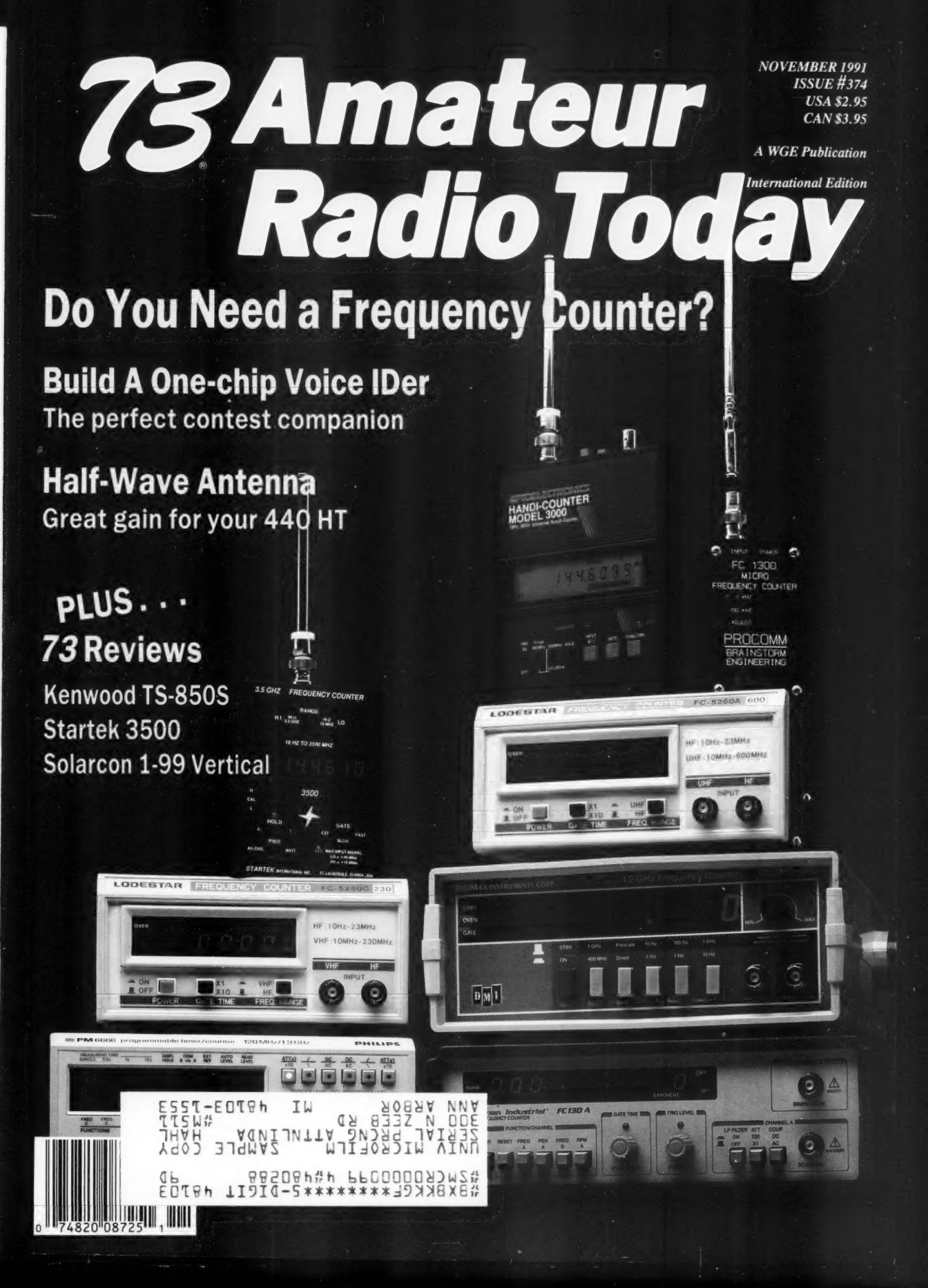

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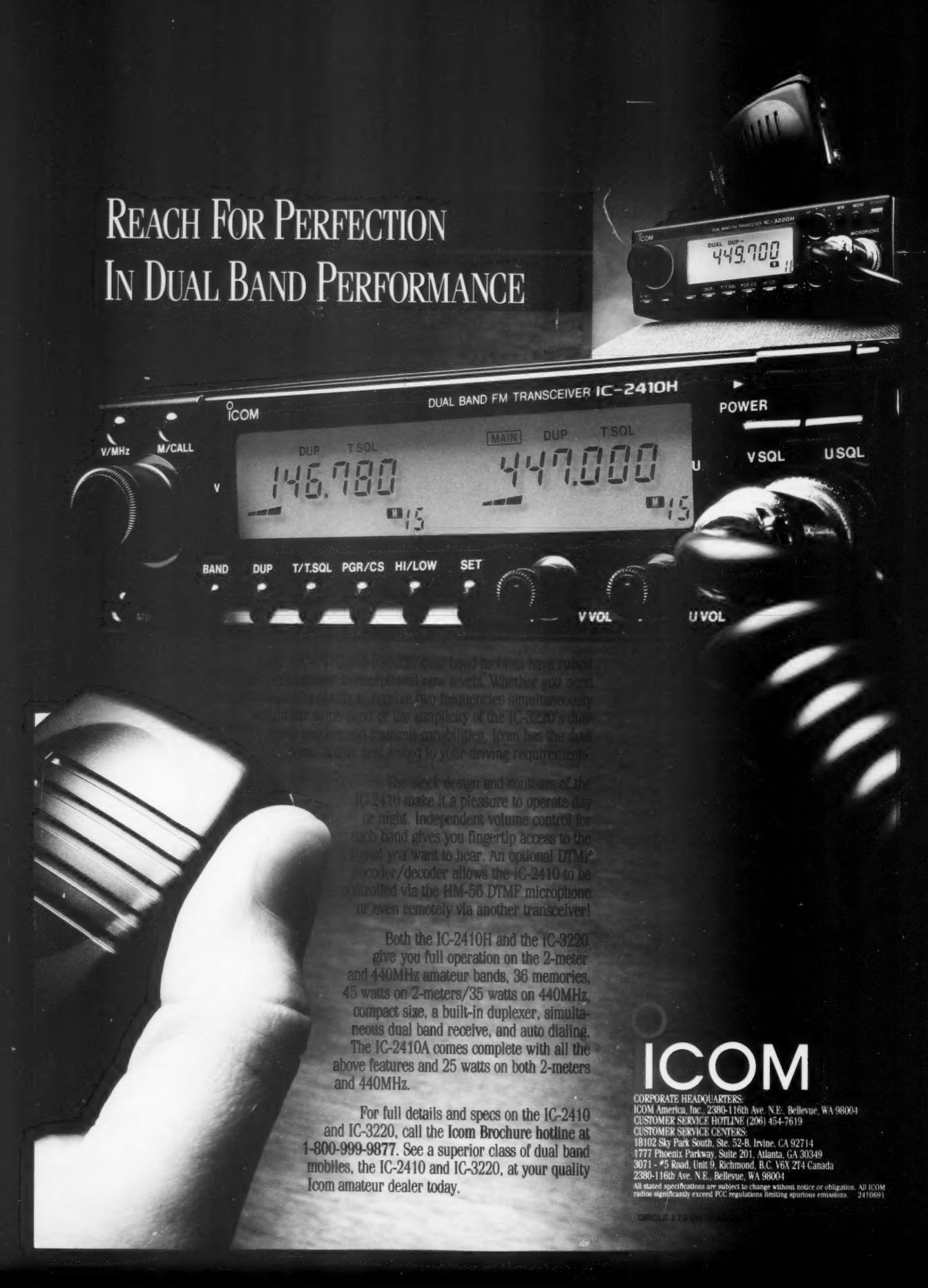
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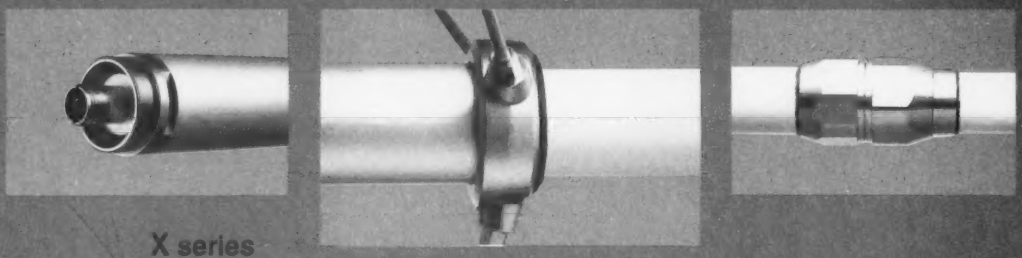

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X-200A DUAL-BAND REPEATER VERSION

X-50A DUAL-BAND REPEATER VERSION

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
X-500HNA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-500NA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-200A	2m/70cm	6.0/8.0	200	8.3	UHF	112.5	2m:2-5/8λ,70cm:4-5/8λ
X-50A	2m/70cm	4.5/7.2	200	5.6	UHF	135	2m:6/8λ,70cm:3-5/8λ

U series VHF/UHF MULTIBAND

U-5000A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
U-300A	70cm/23cm	8.6/13.2	150	8.3	N	110	70cm:4-5/8λ, 23cm:10-5/8λ
U-5000A	2m/70cm /23cm	4.5/8.3 /11.7	150	6.0	N	135	2m:6/8λ,70cm:3-5/8λ, 23cm:7-5/8λ

F series VHF/UHF MONOBAND

F-23A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
DP-GH62	6m	6.0	200	21.0	UHF	78	2-5/8λ
F-22A	2m	6.7	200	10.5	UHF	112	2-7/8λ
F-23A	2m	7.8	200	15.0	UHF	90	3-5/8λ
F-142A	1 1/4m	5.5	200	6.0	UHF	110	2-5/8λ
F-718A	70cm	11.5	250	15.0	N	90	18-1/2λ
F-1230A	23cm	13.5	100	10.5	N	90	25-1/2λ

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73 Amateur Radio Today

NOVEMBER 1991
Issue #374

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Cover photo by Larry Dunn.

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Our Kids vs. Their Kids

If you've been reading *Business Week* you already know how American high school kids compare with the Japanese. It isn't comforting. For starters, the Japanese kids spend 60% more hours in school! And they spend an average of 19 hours a week on their homework, as compared to 3.8 hours for American kids. Is it any wonder they're running circles around us in technology?

If you add the homework and class time and ignore outside reading, it would take American kids 22.3 years to equal 12 years of Japanese education! 10.3 years is quite a handicap. Now, about that reading...the Japanese spend almost three times as many hours reading as American kids, so they've got us there too.

Spending more money to solve problems such as increasing the hours kids are in school isn't the whole answer. Forcing them to spend 50% more hours getting a second-rate education doesn't make much sense. Oddly enough, there have been some intelligent studies aimed at finding out what's gone wrong with American education...and they've been published. Question: Have you bothered to read any of them?

Yes, sure you love your kids and you hope that somehow they'll do better than other kids. But do you care enough for them to actually take an interest in their education? Not many parents do. Do you care enough for them to try and keep them from getting leukemia by making sure that they're not being exposed to electromagnetic fields...either from a nearby power line or pole transformer, an electric blanket, etc.? Do you care enough about their long-term health to not smoke around them?

Are you helping to educate your kids or do you mainly train them not to bother you? The American educational system is a mess, but it's organized in such a way that you have a much better opportunity to do something about it than you might think.

Though education is compulsory, the federal government doesn't control it. It's more in the hands of state governments...and those hands are within your reach...if you can force yourself to be interested more than momentarily. I don't want to cut into your hamming time or your watching ball games on TV for anything as insignificant as your kid's education...upon which the whole rest of his or her life depends.

Like quitting smoking or dieting, it's infinitely easier to put it off than to decide to actually do something. I wrote a little about that a few months ago in "Oh Darn, My Kid's Gone Bad." I think that went in one eyeball and out the other. Maybe if you'll try reading my editorials with one eye shut?

How many hours a week do you read magazines and books which will increase your own knowledge...either oriented toward your business or your general education? Sixteen years of school gives you not much more than a foundation from which to start a lifetime of self-education.

I've recently been organizing my library. It's amazing how many books I've read over the last 50 years. Fills 40 six-foot bookcases...and that doesn't count another 50 cartons of books out in the barn. Plus two bookcases for cassettes, three for LPs and six for CDs. My house is beginning to fill up with bookcases! Okay, put me down as a braggart, if that makes you feel better, but I brought it up to show that I'm not asking you to do anything that I haven't done.

How do you feel about people who are making more money than you? Is it luck? Or have they worked harder...or smarter...than you? Are you honestly doing the very best you possibly can at your work? Are you absolutely sure there aren't some books and magazines which might help you do better? How about some courses you might take to help?

And what about amateur radio? Are you trying to learn all you can or are you a glorified CB appliance operator with only a vague understanding of theory? How many of our amateur radio hobbies have you exposed yourself to so far? Each one is a learning experience, and as such can be exciting and rewarding. How well-worn are your ARRL and Radio Handbooks? Tsk!

If you have any kids, have you tried to open their eyes to new ideas and things they can learn? If your kids are over 10, have you interested 'em in amateur radio yet? Kids being naturally contrary, that takes some doing, but it's possible...if you're smarter than your kid. Look at it this way: When you want an OSCAR antenna installed on the roof, are you going to have to climb up there or can you con your kid into it?

Making contacts via OSCAR is a blast. It isn't easy, so you know you've done something when you get good at it. Or do you just call in on a 75m round table and that's it? Or fritter away your life adding to the frustrating pile-ups on DX stations?

Been on packet yet? How about RTTY? Do you even know how RTTY works? Okay, how many data bits per RTTY character? How many for ASCII? How about for digital audio? Five, eight, and 16. Can you explain what a parity bit is?

President Bush has been taking some media heat for spending almost all of his time on foreign affairs and ignoring our national problems. He's been much more vocal about getting Turkey and Greece to stop fussing over Cyprus than he has over our educational disaster, our still-escalating drug mess and worsening crime in America. Maybe we need more media event ineffectual task forces.

Even some Democrats have noticed the national leadership vacuum, though few have had the guts to say much about it. And none have come up with any practical solutions to our mounting problems...they just carp.

I did get a White House leaked preview of their "America 2000" educational proposal, which has been thrown up in the air for target practice. As proposed, it seems like another delicious pork barrel effort, with $1 million for a school in each congressional district...to be used to try and improve the school.

I'm not sure where the government is going to get the needed half billion or why, without some coordination, they expect to see much change in the school system. Considering how the money is going to be distributed, I'm sure our congressmen will find the money somewhere...or just go off budget again. We know the money will be gratefully received and happily spent. Perhaps they'll spend it on higher administration salaries...at least until it's gone.

Unless this is your first brush with one of my editorials, you know that I don't bring up problems unless I have a proposed solution. And I try to make them creative solutions. So then, how can we turn a half billion dollar pork project into something of lasting value? A silk purse?

Let's put this educational project into a familiar frame of reference so we can deal with it. Let's consider this as an enormous technical research project. Obviously we aren't going to make much progress if we have 535 researchers all going their own way without any communications between them.

Scientists achieve progress through communicating via scientific magazines. They research one aspect of their subject, write a paper that is subjected to peer review and is then published. This tends to weed out the flakes and keep science lurching ahead.

The "America 2000" project would make a whole lot more sense to me if the researchers had a peer review magazine to help tie them together. I've been trying to get Rensselaer Polytechnic Institute to let me help them start such a publication for several years. They've inched ahead, starting a Center for Investigating Undergraduate Education (CIUE), but that isn't likely to accomplish much without a publication dedicated to new educational technologies.

Yes, there's a teeny weeny tinge of self-interest involved. Just by accident it happens that I'm in a good position to provide such a publication at a fraction of the normal cost for starting a new magazine. It wouldn't take a big investment to get it going and into the black. There are hundreds of entrepreneurs out there with innovative products they'd like to have schools know about. Schools will be experimenting with computers, networks, video, audio, card readers and so on...and that means zillions of software programs to be evaluated. I think there'd be enough advertising to pay the freight.

With a well-done communications medium I think it would be possible to get good value from the half billion investment. Without it, I smell pork.

Your congressmen and senators are going to be very interested in getting the million for their schools, so it's unlikely there's going to be a great groundswell opposing this bonanza. Write to your representatives and explain that you're going to be watching to see if they spend the money right ...and that without a communications medium to help guide the participating schools as part of the package the likelihood of anything positive happening is slight.

Sherry says I'm wasting my time since 90% of you don't even have a clue as to who is representing you in Washington. I think she's wrong...it's probably 80%. Well, I know my mine...like Senator Rudman. And he knows me too. I write him. I visit him when I get to Washington and discuss what's happening.

Our ex-congressman Judd Gregg is now the governor of New Hampshire

Continued on page 74

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TM-741A Modular FM Transceiver

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Your ultra-compact TM-741A offers a full 50 watts on 10, 6, and 2 meters; 35 watts on 450 MHz; 25 watts on 220 MHz, and 10 watts on 1200 MHz!

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Multi-function DTMF microphone. Separate antenna and speaker outputs. Auto power off and time-out. 4 step dimmer. 3 step power. Clock, timer and calendar. DC cable, and mobile bracket.

UT-28S: 28MHz, 50 W, RX: 24-36 MHz, TX: 28-29.7 MHz. **UT-50S**: 50MHz, 50 W, RX: 46-57 MHz, TX: 50-54 MHz. **UT-220S**: 220 MHz, 25 W, RX: 215-230 MHz, TX: 220-225 MHz. **UT-1200**: 1200 MHz, 10 W, 1240-1300 MHz. **DTU-2**: digital paging unit. **PG-4K**, **PG-4L**: remote cable kit. **MB-11**: extra mounting bracket. **PG-2N**: extra DC cable. **PG-3B**: DC line noise filter. **TSU-7**: CTCSS encode/decode unit.

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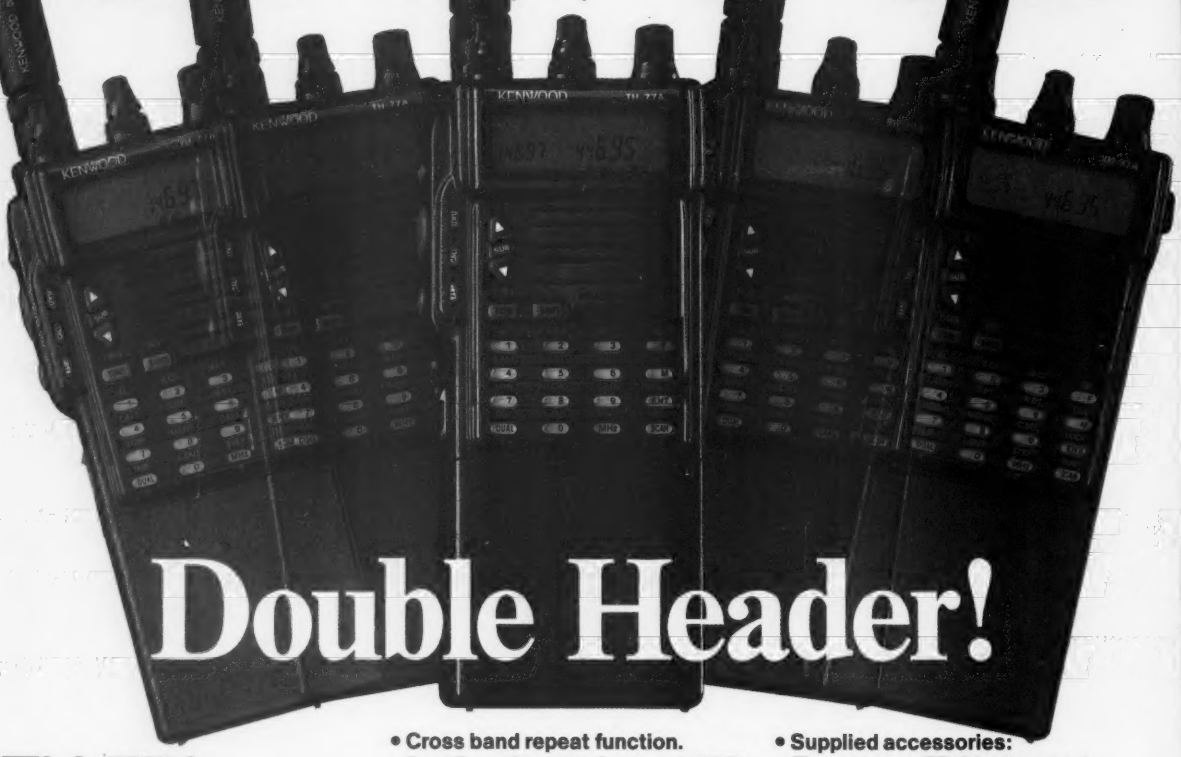

Double Header!

TH-77A

Compact 2m/70cm Dual Band HT

Here's a radio that deserves a double-take! The TH-77A is a feature-packed dual band radio compressed into an HT package. The accessories are compatible with our TH-75, TH-25, and TH-26 Series radios. Repeater and remote base users will appreciate the DTMF memory that can store *all* of the DTMF characters (*, #, A, B, C, and D) that are usually required for repeater functions!

- **Wide band receiver coverage.** 136–165 (118–165 [AM mode 118–136] MHz after modification) and 438–449.995 MHz. TX on Amateur bands only. (Two meter section is modifiable for MARS/CAP. Permits required.)
- **Dual receive/dual LCD display.** Separate volume and squelch controls for each band. Audio output can be mixed or separated by using an external speaker.
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Optional accessories:
• **BC-10:** Compact charger • **BC-11:** Rapid charger • **BH-6:** Swivel mount • **BT-6:** AAA battery case • **DC-1/PG-2V:** DC adapter • **DC-4:** Mobile charger for PB-10 • **DC-5:** Mobile charger for PB-6, 7, 9 • **PB-5:** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6:** 7.2 V, 600 mAh NiCd pack • **PB-7:** 7.2 V, 1100 mAh NiCd pack • **PB-8:** 12 V, 600 mAh NiCd for 5 W output • **PB-9:** 7.2 V, 600 mAh NiCd with built-in charger • **PB-11:** 12 V, 600 mAh OR 6 V, 1200 mAh, for 5 W OR 2 W • **HMC-2:** Headset with VOX and PTT • **PG-2W:** DC cable w/fuse • **PG-3F:** DC cable with filter and cigarette lighter plug • **SC-28, 29:** Soft case • **SMC-30/31:** Speaker mics. • **SMC-33:** Speaker mic. w/remote control • **WR-1:** Water resistant bag.

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QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Handicap Exemption Clarified

Last December 1990 the FCC changed its policy against code waivers, exempting severely handicapped amateurs from the 13 and 20 wpm Morse code requirements. Recently, the FCC clarified the term "severe handicap" to mean "a disability that extends for more than 365 days after the certification." This announcement comes at a time when some amateurs are thought to be asking for exemptions for handicaps that do not interfere with telegraphy.

The beginning 5 wpm code requirement cannot be waived, since international agreement requires telegraphy knowledge for operation under 30 MHz. However, Volunteer Examiners (VEs) are required to "accommodate" severely handicapped examinees at the 5 wpm level—even to the point of accepting a sending test for code receiving, or just identification of all 43 characters.

The FCC, of course, does not make medical diagnoses. It will exempt disabled amateurs from the higher speed requirements on receipt of a doctor's documentation of the severe handicap. The FCC only permits medical doctors (M.D.s) and Doctors of Osteopathy (D.O.s) to certify an examinee for the waiver. The examinee must sign a release permitting disclosure to the FCC of medical information.

The handicap waiver has generated controversy in many areas. One of the latest has been over the definition of a qualified medical practitioner. The American Optometric Association thinks the FCC's definition is "arbitrary and capricious, and without plausible support in the rulemaking record." The AOA believes that optometrists should be included in the definition, too. The ARRL is concerned that some (nonham) physicians may not appreciate the importance or purpose of the waiver. And David B. Popkin W2CC of Englewood, New Jersey, noted that FCC rules do not require the handicap to be permanent. "A broken writing arm could result in a perfectly legal certification at the time, even though the individual will be cured in a short time." Popkin requested the FCC to issue a uniform criteria to physicians nationwide. In response, the FCC issued two pages of information, Fact Sheet PR-5000 Number 205, and added the 365-day requirement to the rules. The Fact Sheet does not list specific disabilities which qualify for the waiver.

Dennis C. Brown (callsign unknown) argues with the FCC that if demonstration of code skill is necessary to protect the public interest, then it should not be waived for any applicant; but if the public interest does not require proficiency in code, then there is no valid reason to maintain the requirement for any applicant.

Disabled amateurs who are upgrading from General Class are now objecting to having to obtain another original certification from a physician for each upgrade, and they contend that a Certificate of Successful Completion of Examination for Element 1(C) (the 20 wpm requirement) should not be subject to expiration. At present, Part 97.505 rules do not provide for CSCE credit beyond a 365-day limit. TNX *W5YI Report, Vol. 13, Issue #17.*

New IRCs

A new version of the International Reply Coupon (IRC) is now out. The new version states that it is redeemable for the minimum airmail postage to another country. The older version was redeemable for postage equal to the minimum *surface* postage.

In the U.S., post offices should exchange valid IRCs from other countries (stamped on the left) for 50 cents worth of stamps. IRCs continue to sell for 95 cents. In theory, U.S.-issued IRCs can be exchanged for the original purchase price (in the center) minus a one-cent handling charge. In practice, few post offices offer this option. If you run into problems redeeming IRCs, refer your postmaster to section 392 in the International Mail Manual.

If other countries follow the U.S. example, and exchange even the older version IRCs for current air mail postage, the practice of requiring more than a single IRC for return postage of a single QSL card should end. Any DXer who purchases the new version IRC should point out to the DX station that this IRC covers return airmail postage. Any DX station requesting more than one IRC would be charging for QSL cards, a possible violation of DXCC Rule 12(c). TNX *The DX Bulletin, Issue 602.*

PELTS Now Dead

The proposed Personal Emergency Locator Transmitter System (PELTS) had too many problems, the FCC says. The channels held in reserve for PELTS were released to Private Land Mobile Radio Service use last August after the FCC concluded that at this time PELTS could not adequately meet the public need for emergency communication in remote areas. Had PELTS succeeded, it would have used frequencies in the 220–222 MHz band.

In December 1989, in response to a petition filed by Kenneth Seymour KA7OSM, the FCC proposed PELTS for two reasons: emergency rescue and reduction of the illegal use of emergency locator transmitters and emergency location-indicating radio beacons. Seymour, a cellular telephone engineer in Beaverton, Oregon, had originally conceived of modifying the 70 MHz Radio Control Radio Service rules for assisting those in distress in remote areas.

The FCC sought input from organizations and individuals. Fifty parties, consisting of search-and-rescue (SAR) organizations, the Civil Air Patrol, local and state agencies, manufacturers, radio user organizations, and individuals, responded with comments, and eight filed reply comments.

After carefully reviewing the responses, the FCC's decision to reject PELTS was apparently based on two issues: the watch-and-response system for PELTS was not sufficiently developed, which would result in uneven usage and a lack of support for refining the new technology; and the legal trend of pursuing large damage suits would probably discourage individuals and organizations knowledgeable in search and rescue operations from participating in PELTS.

For now, people camping, hiking, mountain climbing, or living in remote areas will have to continue to rely on devices such as smoke flares, strobe lights, signal mirrors, and balloons to alert search-and-rescue teams of distress and the need for emergency intervention. The FCC is looking to the Interagency Committee on Search and Rescue (ICSAR) for guidance on future developments. TNX *Westlink Report, No. 608.*

Earthwinds Balloon

In mid-November, the Earthwinds around-the-world manned balloon flight will be launched from northeastern Ohio. As described in the March '91 ATV column, three balloonists will fly at 35,000 feet in a pressurized capsule as they circle the globe. Captain Larry Newman KB7JGM plans to operate from the balloon on 28.303 MHz throughout the mission. In addition, when he is occupied with other duties, there will be a CW or voice telemetry downlink on this frequency which will periodically relay the balloon's current latitude, longitude, altitude and ground speed. Since this is the same frequency that is used by the CQ All School's Net (the net meets every Tuesday and Thursday at 12:30–1:30 pm Eastern time), it's hoped that schools as well as hams worldwide can have a great time tracking the balloon's progress on its record-breaking non-stop flight.

While over the U.S., there will also be a live TV downlink from the capsule on 434 MHz (fast-scan ATV) as well as a 2m FM signal on 144.340 MHz.

Number 3 on your Feedback card

LETTERS

From the Hamshack

Keith Littlejohn via 73 BBS You told us a while back that kids should be able to learn the code at 20 wpm as easy as learning 5 wpm.

We (Kyla N7JVA and I) have five kids, and the three big ones (8, 7, and 5) are getting interested in ham radio and want HF privileges. So where are the 20 wpm tapes for beginners?

This isn't a silly comment! All of the high-speed code tapes are for upgrading from slower speeds, not for starting from scratch.

20 wpm is 20 wpm, so what would be different about a tape for beginners?

As I've written in my editorials every few years, you sit down with a 20 wpm tape and start listening. It's a blur, right? Not quite. If you start listening, you'll hear an E when it goes by. Write down E every time you hear it. Then start listening for T, and write down both E and T as they go by. Next start listening for I, and so on through the alphabet. It's a cinch. In a few hours, you're copying all of the letters, numbers, and punctuation . . . and at 20 wpm. Beats the hell out of trying to gradually speed up . . . . Wayne

Jeffrey Viola, Jackson NJ I am a new subscriber to *73 Magazine*, and a wanna-be ham for about 25 years (I'm 36). Probably would have become one as a youngster, but neither my father nor anyone else would take time with a 10-year-old who loved to take apart walkie-talkies, radios, or any other electronic gadget. Over the past two years, I bought the *ARRL Handbook* and every old *QST* I could get my hands on, and have been teaching myself radio electronics. Was gonna go for my Novice (old style) CW ticket, but something held me back . . . perhaps it was the coma I slipped into listening to the local ham club weekly rag-chew on 2 meters.

When I heard the FCC was going to issue no-code tickets, I jumped for joy! After all, I'm currently employed by a major stock brokerage house as AVP of their communications dept. Talk about technology—we've been sending data via modems at 9,600 bps for a decade. I have one 18 GHz and 23 GHz microwave radios (digital!) linking our headquarters. The 23 GHz radio alone gives me 28 channels, each 1.544 MHz wide! When the big earthquake hit California two years ago, we talked to our people on cellular radiophones. I'm looking into hooking up our SUN workstations on RF or infrared LANS. And "you" wanted me to learn code? Give me a laptop PC hooked to microwave spread-spectrum radio!

The point of my letter is this, however: For all the editorial lip service, *QST*, *73* (yes, *73*), and other publications have given to the new no-code ticket, where are the articles for the potential no-code ham? Other than the one-shot, pat-on-the-back short articles last spring, I have not seen one article. If a computer literate kid picked up this issue of *73*, would he know he could get a ham ticket? I called the local ham club and asked about it, and got less info from them than from a reluctant witness at a Mafia trial . . . .

I personally believe that everyone is afraid that 50 MHz+ will become CB-land. Where are, at least, the UHF articles? Why not get electronics/ham advertisers to put out a special no-code one-time magazine? Charge a few bucks and put it on the racks for one year? And let us know where to sign up to take the no-code??

Jeffrey, we've published quite a few VHF and UHF articles recently. Look for future issues which will show you ways to enter the exciting world of VHF/UHF without breaking the bank. By the way, the magazine you'd like to see is a reality . . . it's called Radio Fun, *and is now into it's third issue! . . . . Bill WB8ELK*

Richard Bovee KF8NT, Toledo OH It has been said that along with the influx of the new no-code Technician class amateurs will come new technology. Along with that influx will come new amateur organizations, each striving to be the best they can be, serve their community and better the communications in their area. This, of course, will mean more repeaters. Herein lies the problem: repeater coordination. Good luck! This is exactly the situation we have found ourselves in. We cannot seem to find a 2 meter frequency that can be coordinated. Paging through the repeater directory, I find in some instances, and not to my amazement, more than one repeater per band per individual/club.

Do you suppose the time is near when the FCC should restructure the assignment of repeater frequencies and allow only one frequency pair per band per individual/club?

Jeffrey C. Montgomery WB4WXD, Palestine TX Congratulations on having a fine magazine that attempts to tell it like it is in the amateur community. Mr. Green's columns make life interesting, to say the least, and is the first thing turned to every month. BUT, I have to disagree with a statement made regarding Morse code as it pertained to emergency communications. Mr. Green stated that he was not aware of an emergency situation where code was used in lieu of voice or other modes because of their inability to get through atmospheric conditions. I was personally involved in a situation that proved said value of the code to do just that.

On November 15, 1987, East Texas was hit by several tornados. Our town was particularly hard hit, and lost most of its local and all of its long-distance telephone service. The local ham community swung into action and set up command posts throughout the city. Connection was made to the evening NTs traffic net on 75m using SSB as the primary mode. Because of the static crashes on the air, voice operation was unintelligible. The operators on both ends switched to CW, and although difficult to copy, the traffic did get through that night. The next morning when conditions improved, the traffic was handled on 40m SSB. In all, over 400 pieces of traffic were handled from as far away as Australia. The code proved essential to our operation that first night. We used SSB and packet for the majority of the remaining Health and Welfare traffic.

I am an Extra class ham who has paid his dues to the 20 wpm deity, but I also support the no-code Technician for those who desire to go that route. I've seen some fine, new Techs who are valuable to the service. But I think the reported death of CW is premature. Let's not write off a mode of communication that has proved itself of great value over the years.

Darren Leno WD0EWJ Now that you've piqued my interest in microwaves and all the other things I haven't tried yet, I'd really enjoy seeing more articles on the subject. Take us beyond 10 GHz, and show us where to go to teach ourselves more.

I would also like to see an article that describes the mysterious modes that we hear about but never quite understand, like pulse modulation and spread spectrum. I think many of us don't understand what we are even allowed to do on these high frequencies, let alone how to do it.

Thanks to your badgering, I've become very interested in trying modes that are new to me. I'm saving to buy fast-scan TV equipment, and recently purchased an MFJ digital thingamajiggy so I can learn about ancient modes like AMTOR, RTTY, packet, and stuff. I know I'm 10–30 years behind the times, but better late than never. Moon bounce holds a big fascination for me, and I've been listening to their nets on 20 meters.

Hey, why don't we put a 24 GHz repeater on the moon?

As for your plea to get "good" hams on 20 meters, I went and bought an HF rig just for you. I absolutely cannot believe what I hear on 14.312 (or thereabouts). It makes you want to do something, like tell those guys off. But then, we become part of the problem. So what is the solution? If hams are going to be self-policing, let's give hams some police power.

Darren's Big Solution to the 20 Meter Fiasco: Any ham who has not incurred a violation may become a "Band Monitor" after receiving approval by a full vote of the VEC organizations. If there is any objection by any VEC, that person will not be eligible to become a Band Monitor, but may reapply after one year. There will be no less than 100 Band Monitors and no more than 200.

The specific qualifications for becoming a Band Monitor would be decided later, but this method would prevent any one group from monopolizing the policing function. Band Monitors are responsible for monitoring the bands and issuing "notices" for simple violations. If a ham is a frequent offender, or commits extremely disruptive actions, the Band Monitor complaint is referred to the Hearings Board with the evidence (tape recording).

The Hearings Board is made up of two hams appointed by each VEC. These hams would hear complaints brought by Band Monitors and would have the authority to dish out license suspensions of up to one year. Revocation would be a penalty that only the FCC, on the recommendation of the Hearings Board, would be able to implement.

I think hams need to give themselves some teeth, Wayne. The FCC already makes a provision to listen to the advice of frequency coordinators in disputes arising from repeater interference cases. Why not give the VECs a little more authority to regulate the hams they are licensing?

Howard Pomeroy KA1ZCY, Suffield CT One of the reasons I'm writing is to inform you that I finally passed my Novice CW and theory, and now, Wayne, I am a ham. My callsign is KA1ZCY, and I am so proud of it. My only regret is that my dear Mom and Dad weren't here to share my excitement with me.

73 is a fine journal, my only comment is I wish the "DX" column were a bit larger.

G. Eric Ferguson KA6USJ, Concord CA OK. You've finally done it!! I am now motivated to upgrade from Novice to Tech. I'm your 8th place winner in the Ham-It-Up Sweepstakes. Up till now, I have had many excuses to not upgrade. Lack of money, no place for an antenna, can't remember code, etc., well, you get the idea. Even my Commodore 64 was given to me, and now it's an orphan. I have never been on the air yet, and have had my license for around 10 years. I admit I was hoping to win an HF rig, but I think I'm really going to enjoy the 2m/440 rig. THANKS!!

Fran KG7NZ via 73 BBS I enjoy your magazine immensely. Never stop griping and grousing, it encourages the rest of us to consider other ideas and problems. I also look forward to logging some time on your BBS now that it is up and running.

The new BBS has been up and running full-time since the end of July. Everyone is welcome to browse through the ever-growing list of useful programs you can download. We now have over 1000 users! Feel free to give it a call at (603) 525–4438. . . . Bill WB8ELK

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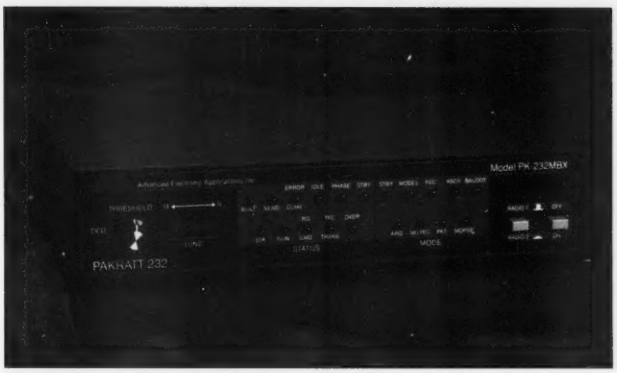

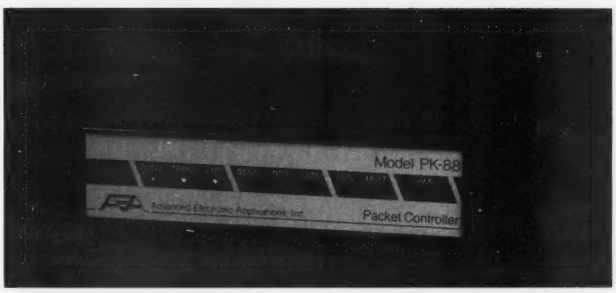

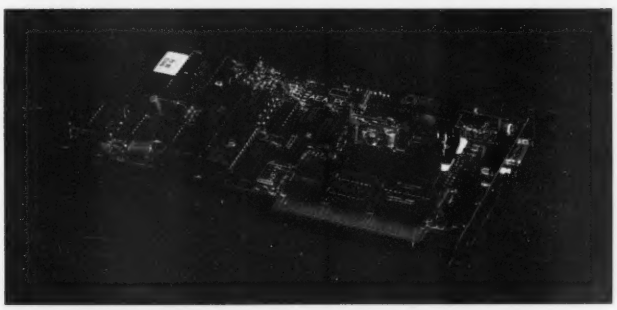

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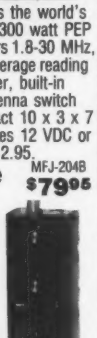

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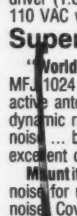

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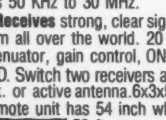

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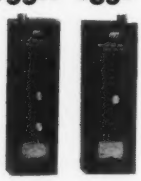

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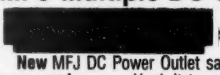

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Voice ID on a Chip

Throw your voice with this versatile circuit.

by Bill Brown WB8ELK

Every so often a device appears on the market that really gets my attention. A company called Information Storage Devices (ISD) recently introduced an IC chip called the ISD1016. This little wonder is the equivalent of a tape recorder on a chip! It eliminates all of the analog-to-digital (and digital-to-analog) circuitry that was required in the past to store and play back voice messages.

One-Chip Voice Storage

This single IC contains a microphone preamplifier, storage circuitry and an audio amplifier. This means that you only need to add a microphone, a speaker and a couple of switches and you have a complete audio recorder and voice identifier. The ISD10XX series utilizes a storage technology similar to that of an EEPROM (Electrically Erasable Programmable Read Only Memory). You may have heard of EPROMs (Erasable Programmable Read Only Memory). You can write data into an EPROM, but it requires a dose of ultraviolet light to erase the memory. Data can be stored into an EEPROM, but it is easily erased with a voltage instead of UV light. This gives you a powerful storage device that can be used over and over again many thousands of times.

The amazing thing about this technology is that the memory is non-volatile. That means that you can remove all power from the IC, even take it out of its socket, and it will retain all of the data stored inside. For example, you could record your voice, set the ISD chip on a shelf for years, plug it back into your playback circuit, and your voice would still be there! One other advantage of this EEPROM technology is that the ISD device samples and stores the actual voltage levels (analog storage) of the recorded audio, resulting in a high-fidelity playback.

Audio Fun

Since most of the complicated digital circuitry is eliminated with this new IC, it's easy to build up some very interesting audio devices. You may have seen those talking key chains with a few canned phrases. Now you can build your own version (although somewhat larger) that talks in your OWN voice. It's quite a lot of fun to put one of these in your pocket, hit the playback button, and watch as people think you're a fantastic ventriloquist. Be careful what you record, it could get you into trouble if you hit the button accidentally! In its simplest form, you can use a voice storage unit as an electronic note pad. You could leave messages for your family and friends, which they could play back later. Add a few switches and a few more components and you have some very powerful audio aids for your hamshack!

Contest Microphone

If you've been in a contest or an event such as Field Day, you know that endlessly repeating *"CQ Field Day, this is..."* can wear you down after a while. Wouldn't it be great to have a device that sent this message out (in your own voice) with the push of a button? How about storing two messages on one chip? A voice identifier which can hold two (or more) additional messages, such as *"You're 5-alpha in New Hampshire,"* would really save those vocal chords. You would only need to speak into the microphone to acknowledge the other station's callsign.

How it Works

The ISD1016 IC chip can record and play back a 16-second message (their new ISD1020 chip can be substituted in the circuit and allows 20 seconds of recording, but at a reduced audio bandwidth). The folks at ISD added digital control to their IC, allowing you to select the starting point address of your message. With the appropriate circuitry, you could divide up this 16-second chip into 160 messages, although they would be only 0.1 second long. For our voice ID, we'll use just two of these address lines to divide our 16-second storage area into two 8-second messages. Note, however, that if you start recording your message at the beginning of the chip, you can use the whole 16 seconds for your message if you so desire.

Your voice is fed into the storage chip via a miniature electret microphone. Toggle switch S3 sets up the voice ID chip to either a record or playback mode. Push-button switch S1 (momentary contact) selects the message start address and activates a 555 timer which brings the 1016's Power Down (PD) and Chip Enable (CE) lines low to start the message number one playback. In a similar manner, switch S2 selects message number two. After each message is played back, pin 25 on the ISD1016 goes low (the end of message signal, or EOM). The voice ID circuit uses this to reset the 555 timer which puts the voice identifier IC into standby mode for extremely low current consumption (3 milliamps when using a voltage regulator, and 150 microamps without the regulator when using a 5 or 6-volt supply). *[Note: If you operate this circuit without the 7805 regulator, do not exceed 6 volts for a power source. If you go this route, substitute a 1N4001 (or equivalent) diode in place of the voltage regulator, as shown in the schematic in Figure 1.]*

To record, switch S3 bypasses the timer circuit and selects the Play/Record input on pin 27. This allows you to activate the ID chip, as long as you hold down on one of the message push-buttons.

The ISD chip was designed to function in a cascaded fashion with a number of ICs in series for extended recording time. When one chip overflows its storage area, it uses the EOM line to turn on the next IC in the cascade. In a single-chip application you need to reset the voice storage device to continue operation if it overflows. This is done by bringing the PD (power down)

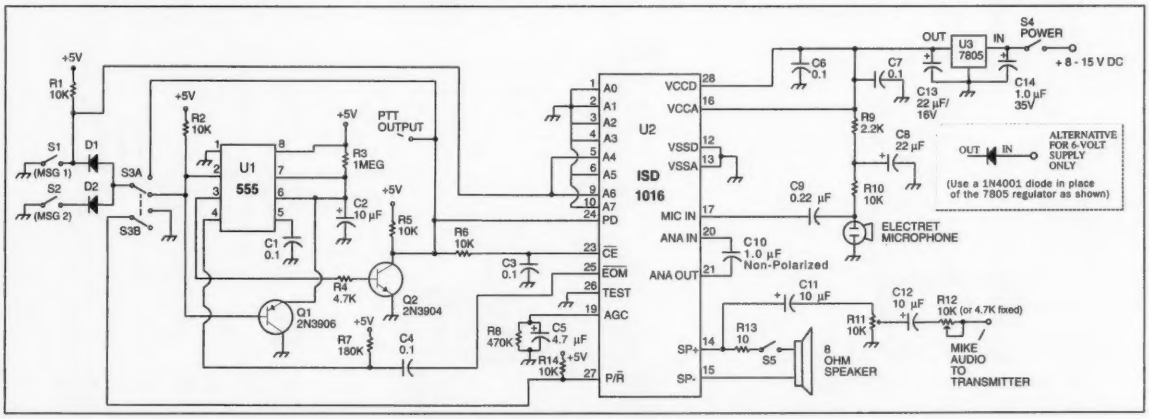

Figure 1. The voice ID schematic diagram.

line high (which also puts it into the standby mode). The 555 timer IC also functions as a watchdog timer in case the 1016 doesn't get reset properly. If the voice storage chip goes into an overflow condition, the 555 timer will power it down after 20 seconds. Since the current drain is so low in standby, you can leave the voice ID on for long periods without worrying about your battery life.

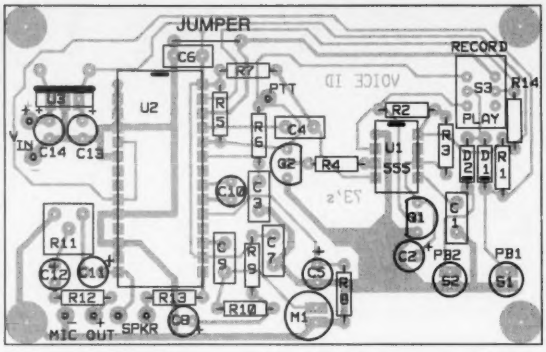

Figure 2. Parts placement overlay (viewed from component side).

The ISD chip interfaces directly to a small speaker. Our circuit taps off of the speaker output with two potentiometers, R11 and R12, which lower the audio signal output so that it can be used on your transceiver's microphone input (typically about 20 to 100 millivolts).

Assembly

An etched and drilled printed circuit board (see the Parts List) is available which will make assembly of your voice ID easy. As an alternative, if you're used to breadboarding circuitry, everything should fit on one of the smaller prototype boards from Radio Shack. If you use the PC board, you can attach the push-button switches S1 and S2, as well as S3 and the microphone, directly to the board. You only need to wire up a power switch, a battery pack and the speaker. If you want to interface the voice ID to your transceiver, you will have to wire up an appropriate microphone cable (the proper mike diagrams should be listed in your owner's manual). For a contest microphone application, you will have to make up a switch or relay to flip between the voice ID and your regular microphone (you can use the point marked PTT on the PC board and the schematic to trigger an automatic switch or relay when the board is talking). You may also be able to parallel the output of the voice ID across the audio input line on your rig's microphone plug.

If you use a Radio Shack project enclosure, you can mount everything inside (including the battery) to give you one very compact package. If you want to use a 9-volt battery or your shack's 13.8 volt supply, you should wire up the 7805 5-volt regulator (see the parts placement diagram and schematic). Your standby battery drain will be higher since the voltage draws a few milliamps in standby. For the ultimate in miniaturization, I use a tiny 6-volt single cell battery.

Operation

To record your message, just flip the *playback/record* switch to the "record" position, hold one of the *message* buttons down, and talk into the miniature electret microphone. As long as you hold down the *message* button, your voice will be recorded. If you want to record two messages, make sure you don't talk over eight seconds for each segment. Don't worry about filling up the whole eight seconds—the ISD1016 has a built-in *End Of Message* (EOM) indicator that tells it when the end of each message occurs. If you only record for two seconds, your playback will end in exactly two seconds. Note that if you exceed eight seconds for message number one, the EOM signal will not work and you'll run over into message number two. If this happens, you'll just have to try recording again. If you want just one message (up to 16 seconds long), record it into message one and ignore the message two button.

To play back your messages, flip the *playback/record* switch back to the *playback* position and hit the message button of your choice.

When using the audio output to drive your HF or VHF rig, adjust potentiometers R11 and R12 (start out with R12 at the mid-range positon) for the best quality output from your transmitter. If

Continued on page 61

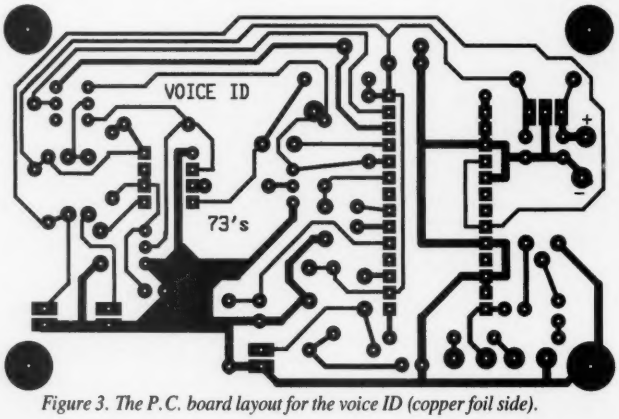

Figure 3. The P.C. board layout for the voice ID (copper foil side).

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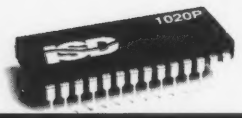

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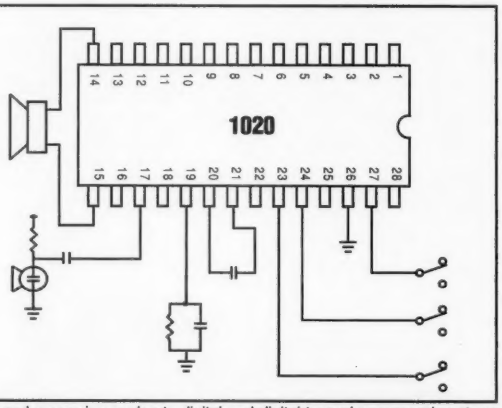
WA6TJM

Shown is the ISD 1020 chip and typical external circuit to allow single chip analog recording and playback.



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Portable Frequency Counters

Versatile test equipment that you can really count on.

by Gordon West WB6NOA

Do you own a portable frequency counter? Every ham should have one. Even though you might not do your own internal adjustments to your equipment, a portable frequency counter is a valuable amateur radio accessory.

Here are some everyday ham radio situations where a portable frequency counter can really come in handy. Let's take a look at a typical day in the life of a counter.

RDFing

You can use your portable frequency counter to identify sources of radio frequency interference. This activity is also called radio direction finding, or sniffing. I used mine to pin down the problem of an electric garage door that mysteriously flew open at 5:00 p.m. every afternoon except on the weekends.

The counter registered 151.62500 as the door swung into action, and a quick check up and down the street revealed a utility truck with a high-band antenna on the roof. Sure enough, the driver's "at home, 10-7" transmissions at 5:00 p.m. were the cause of the door energizing. A couple of 0.01 microfarad bypass capacitors on the door opener solved the problem.

With some of the newer counters you can actually read the frequency of a 50 watt VHF mobile signal up to 250 feet away. With lower power HTs you can usually read their frequency from a couple of feet away (sometimes from across the room, depending on the sensitivity of the counter).

Do you own a cordless telephone? Trouble with interference from a neighbor? Since many people now own cordless phones, and there are only about 10 possible frequencies, you can resolve interference problems by first figuring out who's on what channel. Usually the channel number is marked on the phone, but that's the first thing to fall off after the cordless gets a cleaning.

Cordless phones only put out flea-powered signals. The counter is able to count out the transponder frequency, and the handset frequency, when held within a couple of inches of the phone's antenna system. Not only will you read out the precise frequency near 46 MHz or 49 MHz, but you can also tell whether or not your set is putting out the right amount of power. If you can read the frequency to within a couple of inches of the cordless phone's antenna, power output is normal. If you can't read the frequency with the antennas almost touching, your cordless phone probably has low batteries, or low power output. And once you know what frequency your neighbor's cordless phone is on, simply relocate your base unit further away from their particular direction.

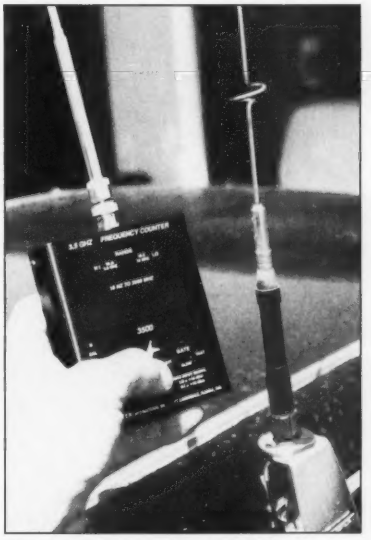

Photo A. To measure the output frequency of your mobile rig just place the counter near the antenna.

Fine-Tune your UHF Station

If you're into 1270 MHz repeaters, 1270 MHz mobile, and HT equipment, a portable counter can really help you fine-tune your sets. You see, equipment at 1270 MHz will many times "age" on frequency, and be as much as 2 or 3 kHz off-channel after a few months of operation. This is because the equipment may use a fundamental crystal still undergoing the aging process. When I checked out my 1282.4 MHz repeater system, I found that the repeater had aged up 3 kHz in just under a year, my handheld had aged down a whopping 6 kHz in six months, and my mobile unit was 2 kHz high.

Placing this equipment back on frequency is easy—hold the counter within a foot of the opened-up equipment, sample the frequency in the slowest rate, and adjust the trimmer capacitor to put the crystal right back on the money. How do you know which trimmer cap to adjust? It's the one usually in the same can as the crystal, and the technical manual for your equipment normally calls out the exact spot on the board. Use an insulated trimmer-cap wand, affectionately known in the land-mobile industry as the "twiddle stick." It's usually yellow with a tiny metal blade. CAUTION—MAKE SURE YOU ARE TURNING THE RIGHT TRIMMER, AND NEVER PRESS DOWN ON THE TRIMMER CAPACITOR. If you fracture the insulating material, you are in big trouble!

Calibrating Your Counter

But how do you know your counter is calibrated? Most counter manuals merely read, "To calibrate the counter, measure a stable signal of known frequency." Hey, wait a

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minute—how do you know that the frequency you are measuring is right on in the first place?

Find yourself a commercial FM radio station tower. FM broadcast stations are constantly monitored by the FCC and the FM station chief engineer for being on frequency within just a cycle or two. Get within a ballpark length of a big FM radio station antenna, and your counter now jumps to life. Many counters require a tiny jeweler's screwdriver to make the calibration adjustment, and you must remove the screwdriver each time you take a reading. First, take readings at the fast gate time to get close, then go to the long gate time for final adjustments. When everything reads out right on the center frequency, you know your counter is on the money. Every town has its own FM broadcast station, so use them to your counter's calibration advantage!

Resolve your Frequency

For sniffing out unknown frequencies, run your counter in the fast gate time. Use slow gate times only for actively calibrating equipment, or checking a set for on-frequency operation. NEVER hook the output of the transceiver directly to the input of the counter—it will surely blow the input IC or transistorized preamp stages in high sensitivity models.

Every ham should own their own counter. I use my counter on almost a daily basis. 73

You may contact Gordon West WB6NOA at 2414 College Drive, Costa Mesa CA 92626.

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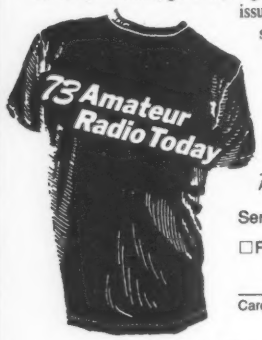

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8	Review: Model 3500 Frequency Counter
9	The Heli-Hat Antenna
10	Review: The Solarcon A-99 Antenna
11	Showdown in Portland
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73 Review *by Dave Buren N2GE*

The Kenwood TS-850S

Kenwood USA
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2201 E. Dominguez Street
Long Beach CA 90801-5745
Telephone: (213) 639-9000
Price Class: TS-850S, $1700; DSP-100, $630

A versatile HF transceiver with a digital difference.

Photo. The Kenwood TS-850S HF transceiver.

Unless you've been holed up somewhere, you must have heard of the TS-850S by now. You might even have worked a few on the air. Let's take a look at the amazing attributes of the TS-850S "Digital Machine."

The Manual

The TS-850 manual is fairly well done. It's long enough (74 pages), but in parts it's a bit tedious (translation warp?), like when you find yourself reading a section two or three times to get the exact meaning. But then, I had intended to read it anyway, eventually. (The DSP-100 instruction manual, on the other hand, is a short six pages.)

The "Specifications" and "Installation" chapters are short and concise. They are followed by "Operations." This is the section that relates the functions and controls, and explains how to actually operate the new equipment. To somebody upgrading from an early '70s rig, like an SB-100, up into the '90s, the next 50 pages is where "the rubber meets the road." I prefer to be sitting in front of the unit, power applied, as I work my way through the text and actually perform each detail and step as I go along. The results of a function or operation are instantaneous, and the act of involving more than just the eye/brain makes it easier to relate and remember.

The sections are divided functionally, with page numbers showing where each block of detailed description begins.

The "Circuit Description" section is actually 10 pages of schematics without text. I'd like to see an in-depth step-by-step description of the inner workings and refinements of a unit's various electronic subsections. I know it is pretty rare these days, but it's invaluable when included.

Features

Let's take a look at some of the unique or noteworthy functions, starting at the upper left of the front panel and proceeding clockwise (see the photo above).

AIP: The Advanced Intercept Point, when actuated, bypasses the first RF amplifier stage with a unity gain stage and, as the manual states, reduces interference from strong nearby signals. Input sensitivity drops about 10 dB and the intercept point refers to the third order input intercept.

HIGH BOOST: This is a tone-shaping switch that increases the high frequency roll-off of the mike amp circuit. I made a check on 75m one night with WB8ELK, who lives about four miles down the road and who knows what my voice sounds like. He reported that it sounded most natural with the boost ON. I've kept it on ever since.

DISPLAY: The display is well laid out and intuitive. There's an incredible amount of information compacted into the seven-square-inch area. I still haven't totally accepted the bar graph meter, but that's the opinion of someone who has five analog meters on his home-brew linear amplifier. The bar graph is an S-meter in receive, and indicates power and a choice of SWR, ALC or compression in transmit. It has 30 dis-

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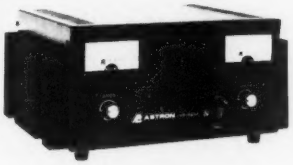

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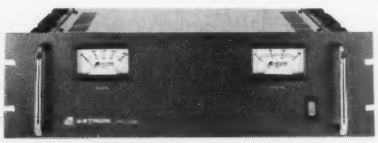
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



RM SERIES

MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

crete segments and will hold the peak reading for about a second (if you select the peak-hold function in the soft menu).

NOISE BLANKER: There are two. NB1 is designed for short duration noise, such as ignition noise; NB2 is for longer duration noise, such as the "woodpecker" over-the-horizon radar.

SLOPE TUNE: You may know how it works, but maybe not how well. In a pile-up you've got to have the optional 1.8 kHz SSB filter, but for the average QSO where suddenly a nearby (1.5 kHz or so) signal pops up, the high cut slope tune really works nicely. High frequency QRM can be totally eliminated without changing the audio quality of the desired signal whatsoever. I'd find myself swinging the cut knob in and out again to see if the adjacent station was still transmitting. He was. The low cut works equally as well (in USB). Totally effective!

M.CH/VFO.CH: This dual-function knob is linked to a 24-position optical shaft encoder. In memory mode it quickly scrolls through the 100 channels of memory. In VFO mode it will step the frequency through in user-programmed steps of 10, 5 or 1 kHz, from the top to the bottom of the band, in less than two quick turns of the knob.

QUICK MEMO: There are five FIFO-type scroll memories which store all set-up and frequency information (receive/transmit frequency, modes, filters, meter selections, antenna tuner setting, etc.) in a stacked fashion. As new frequencies are stored, the oldest (or first) is shoved off the register. This is extremely useful for a scratch pad of activity on a band, and instant recall to any of the five "memos" takes just one keystroke.

FUNCTION: The selection of RX/TX split frequencies for a particular VFO or memory is extremely clear and intuitive. Each push-button is LED-backlit, so you can see the status at a glance.

KEYPAD: This 12-button keypad functions as a direct frequency entry and doubles as a control for the following additional functions: record and playback of the three tracks of the optional DRU-2 digital voice recorder; FINE tuning at a rate of 1 kHz per revolution (it feels almost like an analog VFO); TUNE, which puts out half-power in XMIT and enables zero-beat without carrier in CW; REVerse, which toggles to the opposite sideband in CW receive and XMIT; and PITCH, which selects the tone of the received CW signal.

The DSP Interface

The introduction of the DSP-100 represents one of the first applications of this new technology in a commercial communications receiver, but the effort falls a bit short. The instruction manual states: "Since the processing is done at an IF level, it results in a more copyable signal. Not only are you able to tailor the audio frequency response, but because the signal has been digitally processed it also appears to be cleaner or more crisp." I searched to find the situation where this was so, because this new technology is truly exciting and veritably budding with new and tremendous potential. Under a myriad of different operating conditions and bands and times of day, the unit did not perform any better than the excellent selectivity and interference rejection capabilities of the IF slope tuning of the basic TS-850S.

One of the problems inherent to the design is that the filter switches have only four discrete positions, and the span of the selection is much too limited. The LPF (low pass filter) switch selects 100, 200, 300, and 400 Hz as the roll-off frequency, and that's it. Likewise, the HPF selects 2600 to 3100 Hz in four steps. Technically, it wouldn't be unfeasible for the upper and lower skirts to extend far enough to overlap, and thus comprise an agile digital notch with very precise width and form factors. In the transmit mode I simply had to take Kenwood's word for the purported improvement in suppression of the unwanted sideband. I performed numerous air checks with and without the DSP and most hams could detect no difference.

In CW TX mode, the rise and fall times are adjustable in steps of 2 ms from 2 to 8 ms, presumably to give a softer sounding signal. The difference was evident on the SM220 Monitorscope. The rise time was precisely as it should be, with no overshoot.

Impressions

Twelve volt operation is really a plus! The ability to stay prepared to assist in an emergency is as important a function of our hobby as any other single facet. We should be thinking more about deep-discharge batteries, windchargers and solar panels, and kick the power grid habit.

The power-on-function-selection is one of my favorite features. With one finger, press and hold the USB/LSB key while pushing on the power button. You are into a mode that allows for the customizing of 34 different functions. From sub-tones (burst or continuous) to (bug or iambic keyer) to (RIT range of $\pm$1.27 or 2.54 kHz) to (FSK shift of 170 to 850 Hz) to (10 Hz display resolution ON/OFF), etc. The values are set once and held in non-volatile RAM. Remove power and power up again and the values will be in effect.

Shortwave listening (SWLing) is very easy with the TS-850S. One of the programmable functions just described allows for the selection of the step rate (10 kHz/5 kHz/1 kHz) of the 24-position VFO channel knob. If you set the width to 5 kHz, the rig will step exactly to the assigned channels of the SW broadcast

Digital Signal Processing

The function of any DSP system can be described as follows: The signal is acquired and converted to digital form via an ADC (analog to digital converter), the digitized data is processed by simple fast algorithms, and the results are converted back into a usable form via a DAC (digital-to-analog converter) or stored in memory. The foundation of DSP is Shannon's sampling theorem (you may have heard it before, but here it comes again) which states that a signal must be sampled at a rate that is at least twice as high as the highest frequency in the signal's spectrum.

DSPs are characterized by a small address space, a small specialized instruction set, limited addressing modes, separate data and program paths and, most importantly, a single cycle execution of instructions. General purpose microprocessors are microcoded, meaning that each machine instruction (neunomic) executes an internal "micro" program within the CPU. These neumonics are hardwire-decoded within the processor. This conserves silicon (less costly) and yields a functionally generic microcircuit whose process is dependent upon the microcode. This is what put Intel into the "Fortune 500,"...that little 4004 started it all. Unfortunately, microcoding increases instruction execution time, using multiple internal clock cycles for each instruction. On an 8051, for instance, an External Data Memory bus cycle consists of 12 clock cycles, or T-states, just to fetch data located in off-chip memory. An instruction execution can consume anywhere from 500 ns to hundreds of microseconds. A DSP executes instructions, including the all-important multiply and shift instruction in a single 25 ns to 200 ns operation.

Microprocessors have a single memory used for both data and instructions. They are referred to as Von Neuman Machines. DSPs are Harvard Machines, i.e., they have separate data and program memory (and busses). This feature allows them to simultaneously fetch an instruction and data operand and perform the specified operation at the same time. The Motorola 56000 has two distinct data memories and can operate on both of them in a single cycle. Data memory to a DSP is equivalent to a large bank of general purpose data registers like those found in a standard processor, and can be used in similar ways. DSPs have been optimized to execute a sum-of-products function of the form $A=B\bullet C+D\bullet E+F\bullet G+....+X\bullet Y$. Notice that this is the basic element of a digital filter!

A microprocessor has a problem executing binary, fixed-point arithmetic. When a value overflows a register, it "wraps" around, going from positive to negative or vice-versa. The maximum value can be anticipated, or the calculation can constantly be sampled for overflow, requiring the register to be reset if necessary. DSPs on the other hand have a built-in facility to curb this problem. There is a barrel shifter (a large shift register with the output of the last stage fed back to the input of the first stage) built into the ALU that allows a binary number to be shifted any number of bits in a single cycle. Thus, you can multiply or divide by any power of two in the same cycle. Using multiply and accumulate instructions, the accumulator can be shifted in the same instruction before the result is stored. This allows the binary point of the arithmetic to be moved with little effort. Crunch, crunch crunch!

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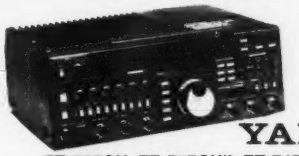

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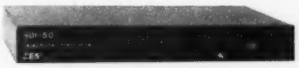

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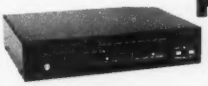

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20 Channel • 5 Watt • Handheld Transceiver
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NEW! RELM® UC102/UC202

List price $128.33/**CE price $79.95/SPECIAL**
CEI understands that all agencies want excellent communications capability, but most departments are strapped for funds. To help, CEI now offers a special package deal on the RELM UC102 one watt transceiver. You get a UC102 handheld transceiver on 154.5700 MHz., flexible antenna, battery charger and battery pack for only $79.95. If you want even more power, order the RELM **UC202** two watt transceiver for $114.95.

NEW! RELM® RH256NB-A

List price $449.95/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority Time-out timer • Off Hook Priority Channel
The *RELM* RH256NB is the updated version of the popular RELM RH256B sixteen-channel VHF land mobile transceiver. The radio technician maintaining your radio system can store up to 16 frequencies without an external programming tool. All radios come with CTCSS tone and scanning capabilities. This transceiver even has a priority function. Be sure to order one set of programming instructions, part # **PI256N** for $10.00 and a service manual, part # **SMRH256N** for $24.95 for the RH256NB. A 60 Watt VHF 150-162 MHz. version called the **RH606B** is available for $429.95. A UHF 15 watt, 16 channel similar version of this radio called the **LMU15B-A** is also available and covers 450-482 MHz. for only $339.95. An external programming unit **SPM2** for $49.95 is needed for programming the LMU15B UHF transceiver.

NEW! RELM® LMV2548B-A

List price $423.33/**CE price $289.95/SPECIAL**
48 Channel • 25 Watt Transceiver • Priority
RELM's new LMV2548B gives you up to 48 channels which can be organized into 4 separate scan areas for convenient grouping of channels and improved communications efficiency. With an external programmer, your radio technician can reprogram this radio in minutes with the **PM100A** programmer for $99.95 without even opening the transceiver. A similar 16 channel, 60 watt unit called the **RMV60B** is available for $489.95. A low band version called the **RML60A** for 30-43.000 MHz. or the **RML60B** for 37-50.000 MHz. is also available for $489.95.

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If you are the dealer or radio technician maintaining your own radio system, you **must** order a programming tool to activate various transceivers. The **PCKIT010** for $149.95 is designed to program almost all RELM radios by interconnecting between a MS/DOS PC and the radio. The **PM100A** for $99.95 is designed to externally program the RMV60B, RML60A, RML60B and LMV2548 radios. The **SPM2** for $49.95 is for the LMV25B and LMU15B transceivers. The **RMP1** for $49.95 is for the RMU45B transceiver. *Programmers must be used with caution and only by qualified personnel because incorrect programming can cause severe interference and disruption to operating communications systems.*

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NEW! Ranger® RCI2950-A3

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bands, thus effectively channelizing precisely. It couldn't be easier. With a tone control knob and plenty of excellent audio, SWLing became one of my favorite program sources when working on projects in the shack or pounding the Mac. I had a surprising renewal of interest in BBC, DeucheWelle, Radio Moscow, etc., and with 100 memories, there's plenty of room to store some prime frequencies.

I really have to stretch a bit to think of anything very negative to say about the TS-850S. I didn't like the RIT span limitations and the fact that it wouldn't reset when returned to later. The potentiometer retains rotation memory (with no center detent). Also, there was not a direct line-level connection from the digital voice recorder to the audio line, except by acoustic coupling (mike up to the speaker).

The automatic antenna tuner is fast and accurate, with very little overshoot or hunting, and the full CW break-in was extremely quick. It was a new experience for me to have it be that quick, and a bit distracting to hear the band condition between dots. When someone would start transmitting nearby while I was sending, I had to knuckle down and really concentrate!

My overall feeling about the TS850S was very, very positive.

There's a function on my decade-old TS-180 which should be in this receiver: frequency difference, between VFO and selected memory. This makes it possible to search for a clear frequency when trying to QSY, and then pop back on frequency and report "up 4.6 kHz," since it is displayed in readout.

The DSP-100 interface heralds the exciting future of digital signal processing into amateur radio and we should be glad to see its arrival. It will be exciting to see what the next generation will be like. I bet it won't be long, 'cause we "ain't seen nuttin yet." 73

TS-850S Specifications

GENERAL	Transmitter frequency range	160, 80, 40, 30, 20, 17, 15, 12, 10 meters
	Receiver frequency range	100 kHz–30 MHz
	Mode	A3J [J3E] (USB LSB), A1 [A1A] (CW), F1 [F1D] (FSK), F3 [F3E] (FM), A3 [A3E] (AM)
	Antenna impedance	50Ω
	Power requirement	13.8 VDC ±15%
	Power consumption	Max transmit 20.5 A; receive (no signal) 2 A
	Dimensions	13"W x 4.7" H x 13" D
	Weight	11 kg (24.25 lbs.) approx.
TRANSMITTER	Final power output	SSB/CW/FM/FSK—100W, AM—40W
	Modulation	SSB—Balanced modulation FM—Reactance modulation AM—Low level modulation
	FM maximum frequency deviation	±5 kHz
	Carrier suppression	Less than −40 dB (Modulation frequency 1.5 kHz)
	Spurious response	Less than −60 dB (CW)
	Unwanted sideband suppression	Better than 40 dB (Modulation frequency 1.5 kHz)
	Microphone impedance	600Ω
	Frequency response	400 ~ 2600 Hz (−6 dB) (SSB)
RECEIVER	Circuitry	Triple conversion system
	Intermediate frequency	1st IF—73.05 MHz, 2nd IF—8.83 MHz, 3rd IF—455 kHz
	Image Ratio	780 dB
	IF Rejection	780 dB
	Selectivity	SSB/CW/FSK—2.4 kHz (−6 dB), 3.8 kHz (−60 dB) AM—8 kHz (−6 dB), 15 kHz (−60 dB) FM—12 kHz (− 6 dB), 24 kHz (minus 60 dB)
	RIT/XIT variable range	±1.2 kHz (10 Hz step), ±2.4 kHz (20 Hz step)
	Notch filter attenuation	More than 40 dB, (audio frequency 1.5 kHz)
	Audio output power	1.5W (8Ω at 10% distortion)

DSP-100 Specifications

Mode	J3E (LSB, USB), A1A (CW), A3E (AM), F1A (FSK)
Output frequency	455 kHz
Input frequency	36.891 MHz
Modulation	SSB—Balanced modulation AM—Low level modulation
Dimensions (W x H x D)	270 x 49 x 286mm (10-5/8" x 2-3/16" x 11-1/16")
Weight	3kg (6.6 lbs.)

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1000 Channels. 8-600MHz, 805-1300MHz

Standard Features:
- Extremely compact size.
- Continuous coverage (except UHF TV 600-805)
- Antenna attenuator switch, 10db.
- Manual tuning knob.
- Earphone jack, 3.5mm.
- AM, FM and wide band FM tuning modes.
- Backlighted LCD display.
- 10 Scan Banks, 10 Search Banks.
- Selectable Priority Channel.
- Delay, Hold Features.
- Selectable Search Increments, 5-955KHz.
- Permanent memory backup.
- 4 AA Ni Cad batteries included.
- AC adaptor/charger.
- Carry Case.
- Cigarette Lighter Charger.
- Belt Clip.
- Earphone.

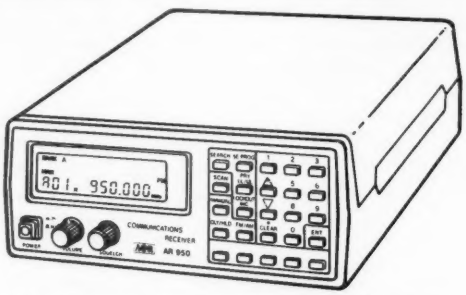
Options:

External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs		$45/$55

Specifications:

Coverage:	8-600, 805,1300MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM
Speed:	20 ch/sec. scan. 40 ch/sec. search
IF:	561.225, 58.075, 455KHz or 10.7MHz
Increments:	5 to 955KHz selectable/ 5 or 12.5 steps.
Audio:	.4 Watts
Power:	Input 9 - 13.8 V. DC
Antenna:	BNC
Display:	LCD
Dimensions:	6 7/8H x 1 3/4D x 2 1/2W. 12oz wt.

AR950 $239



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Standard Features:
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- 100 channels permanent memory.
- Earphone Jack & Attenuator.
- Delay, Hold features.
- Channel 1 Priority.
- 5 Scan Banks, 5 Search Banks.
- Telescopic and Flexible Antennas w/ BNC connector.
- AC & DC Power cords w/ mtng hardware.
- One Year Limited Warranty.

Options:

Base type antenna 25 to 1000MHz w 50'coax.	AS300	$59.95
Mag Mnt Mobile Antenna. 15' coax.	MA100	$25.00
Cigarette Lighter power adaptor.	CP100	$4.00
External Speaker with mobile mount.	MS100	$19.50
Extended Warranty. 2/3 yrs		$40/$55

Specifications:

Coverage:	27-54, 108-174, 406-512, 830-950MHz
Sensitivity:	.4uV Lo,Hi. .8uV Air. .5uV UHF. 1.0uV 800
Scan Speed:	15 ch/sec.
IF:	21.4MHz, 455KHz
Increments:	10,12.5,25,30
Audio:	1W
Power:	12.8VDC, 200MA
Antenna:	BNC
Display:	LCD w/backlight
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D. 14oz wt.

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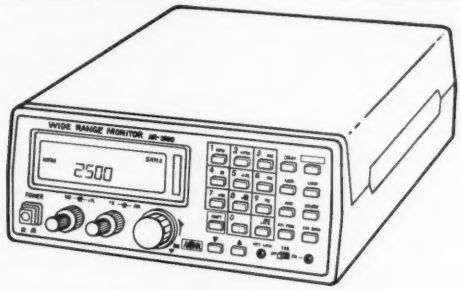


2016 Channels. 1 MHz to 1500 MHz

Standard Features

- Continuous coverage
- AM, FM, wide band FM, & BFO for SSB, CW.
- 64 Scan Banks.
- 16 Search Banks.
- RS232 port built in.
- Includes AC/DC pwr crd. Antenna, Mntng Brckt.
- One Year Limited Warranty.

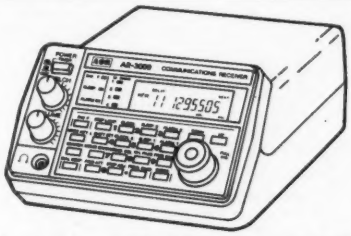
Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS2	$295.00

Specifications:

Coverage:	1 MHz - 1500MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	38 ch/sec. scan. 38 ch/sec. search
IF:	750.00, 45.0275, 5.5MHz 455KHz
Increments:	5,12,5,25 KHz
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 300mA
Antenna:	BNC
Display:	LCD, backlighted.
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D Wt. 1lb.

AR3000 $995



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Standard Features:

- Extremely compact size.
- Continuous coverage
- Attenuation Programmable by Channel.
- Manual tuning knob.
- Tuning increments down to 50Hz.
- AM, FM, wide band FM, LSB, USB, CW modes.
- Backlighted LCD display.
- 4 Scan and Search Banks, Lockout in Search.
- 4 Priority Channels.
- RS232 control through DB25 connector.
- Delay, Hold Features.
- 15 band pass filters, GaAsFET RF amp.
- Sleep and Alarm Features.
- AC adaptor/charger. DC power cord.
- Telescopic Antenna.

Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS3	$295.00

Specifications:

Coverage:	100KHz - 2036MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	20 ch/sec. scan. 20ch/sec. search
IF:	736.23, (352.23) (198.63) 45.0275, 455KHz
Increments:	50Hz and greater
Selectivity:	2.4Khz/-6db (SSB) 12KHz/-6db (NFM/AM)
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 500mA
Antenna:	BNC
Display:	LCD
Dimensions:	3 1/7H x 5 2/5W x 7 7/8D Wt. 2lb 10oz.

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Half-Wave Gain Antenna

For 450 MHz Handie-Talkies

by Phil Salas AD5X

Over the past decade, the 450 MHz band has become as popular as the 2 meter band. Many 450 MHz repeaters have even more features than 2 meter repeaters, including multiband, cross-band repeater operation. Like 2 meters, handie-talkies are also very popular at 450 MHz. Unfortunately, there's not much to be said for the antennas available on these handie-talkies. This article describes a better antenna solution for your 450 MHz handie-talkie.

450 MHz Antennas

450 MHz antennas are generally a quarter wavelength long (about 6-1/2 inches), but don't perform like quarter-wave antennas. I made some measurements using my handie-talkie antenna mounted on a mag-mount base on my car, and compared them to measurements with the antenna mounted directly on the handie-talkie. My test equipment consisted of an ICOM R-7000 receiver, a Smith Engineering Spectrum Probe, and an oscilloscope to display the spectrum. My measurements were made from a range of 100 feet.

The antenna used on the R-7000 was a half-wave sleeve antenna on the end of a 20-foot piece of RG-8M so that I could move it around and verify that I was not getting signal enhancement or cancellation due to reflections. My tests showed a clear and repeatable 2–3 dB advantage of the handie-talkie antenna when mounted on the car versus mounted on the handie-talkie. I suspected that this was due to the quarter-wave antenna requiring a decent ground plane for proper operation. When mounted on the handie-talkie, the ground plane consists of the handie-talkie electronics and case capacitively coupled to the hand of the user.

If this is the case, then a half-wave antenna might be the solution. A half-wave antenna supplies its own image, and therefore doesn't need a good ground plane. And a half-wavelength at 445 MHz is only 13 inches long—certainly a reasonable handie-talkie antenna length. Unfortunately, an end-fed half-wavelength antenna exhibits a very high feedpoint impedance; fortunately, matching to this impedance is not necessarily difficult.

Half-Wave, End-Fed Antenna

Since the half-wave, end-fed antenna exhibits a high impedance, it can be matched with a parallel tuned circuit, the input to this tuned circuit being tapped at such point to give a 50 ohm impedance. This is shown schematically in Figure 1.

The first part of the job involves preparing

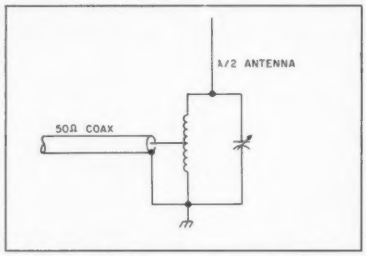

Figure 1. A half-wave gain antenna that takes only an hour to build.

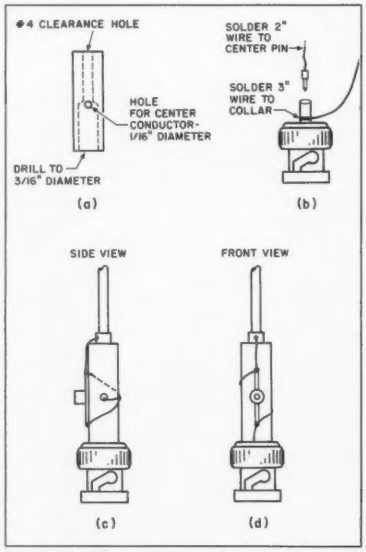

Figure 2. (a) Drilling the holes and (b) soldering the wire. (c) A side and (d) front view of the half-wave gain antenna.

the coil form. The plastic spacer has a small clearance hole drilled through it. Refer to Figure 2. Use a 3/16-inch diameter drill to drill out this clearance hole halfway through the length of the spacer. Now drill a 1/16-inch diameter hole into one side of the spacer as shown in the figure.

Referring to Figure 2(b), solder a three-inch wire to the side of the collar of the BNC plug as shown. Solder a two-inch wire to the center pin. Insert the center pin into the BNC plug. Drop a piece of sleeving over the center pin wire to prevent shorts, and add a drop of quick-setting glue over the end of the insulated wire to keep the center conductor in place.

Add a drop of quick setting glue to the screw threads on the 13-inch telescoping antenna and screw the threads into the spacer. Now feed the free end of the wire soldered to the center pin of the BNC plug into the spacer and out the hole in the side of the spacer. Press the spacer down over the BNC plug's collar such that the side hole is one-forth of the way around the connector from the wire soldered to the connector body. Now we can create the parallel L/C network.

Wrap the wire soldered to the connector body once around the spacer and solder the end to the base of the telescoping whip antenna. Refer to Figures 2(c) and (d), soldering the variable capacitor across the single turn as shown. Finally, bend the center conductor wire extending from the spacer side hole around and solder this wire to the center of the coil exactly opposite the capacitor. You are now ready to adjust the antenna.

Antenna Tune Up

To tune up the antenna, fully extend it, place it directly on the output connector of an SWR meter, and hold it vertically. Since the initial SWR is likely to be quite high, you should operate your transmitter at low power to protect the final output transistor.

Now, key your transmitter and set your forward reference. Switch to reflected power and adjust the capacitor for a minimum reading. It should be easy to see the dip. Reset your forward reference and measure your SWR. It will undoubtedly still be high. Unsolder the center conductor wire from its position on the coil and resolder it repositioned a little closer to the ground

Parts List

crimp-on BNC male plug	50 ohm	Mouser ME174-93701N
spacer	plastic or nylon 5/8"L x 1/4" dia.	Mouser 561-K4.625
capacitor	3.5–20 pf miniature variable	Mouser 24AA072
whip antenna	13" telescoping	Radio Shack 270-1407

I obtained the first three items from Mouser Electronics (800–346–6873). You can get these items from many different suppliers. The variable capacitor needs to cover the 6–10 pF range.

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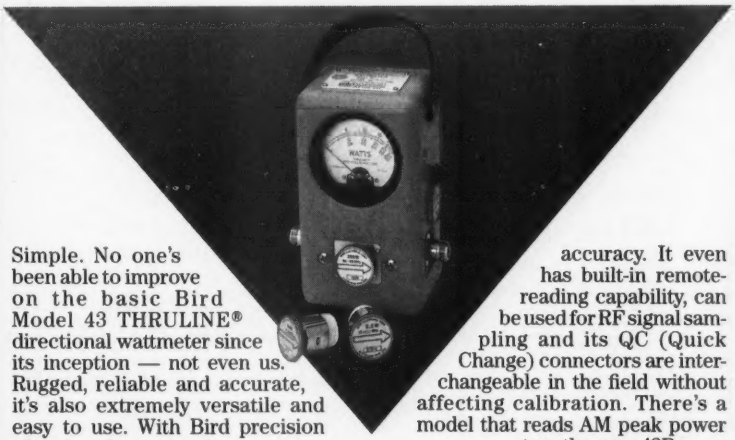

Simple. No one's been able to improve on the basic Bird Model 43 THRULINE® directional wattmeter since its inception — not even us. Rugged, reliable and accurate, it's also extremely versatile and easy to use. With Bird precision plug-in elements, it measures forward and reflected CW power from 100mW to 10,000W, 0.45 to 2,300 MHz, with ±5% of full-scale accuracy. It even has built-in remote-reading capability, can be used for RF signal sampling and its QC (Quick Change) connectors are interchangeable in the field without affecting calibration. There's a model that reads AM peak power too, the new 43P ... or you can retrofit your trusty Model 43 for it in about 15 minutes. Contact us or your Bird distributor for details.

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CIRCLE 176 ON READER SERVICE CARD

end of the coil. Repeat the capacitor dip adjustment and SWR reading. You may have to move the center conductor wire a few more times, but it will be very easy to achieve an SWR of close to 1:1.

When you have achieved a good SWR, carefully coat the entire coil with hot glue. Do not cover up the variable capacitor yet, though. Also coat the coil/connector and coil/antenna interfaces with hot glue. When the glue cools, re-check the SWR and re-adjust the capacitor if necessary. Now go ahead and cover the variable capacitor with hot glue. Your half-wave antenna is finished!

Antenna Comparisons

I re-ran my antenna tests comparing the half-wave antenna mounted on the handie-talkie with the original quarter-wave rubber duckie also mounted on the handie-talkie. Again, the measurements were made at 100 feet using the ICOM R-7000 receiver, Spectrum Probe, and oscilloscope. I measured a solid 6 db improvement of the half-wave antenna over the standard rubber duckie. This is pretty impressive. It is the equivalent of raising your transmit power by a factor of four!

I have described an inexpensive half-wave gain antenna for your 450 MHz handie-talkie. The total time to build this antenna after you have all the parts is only about an hour. Not bad for a 6 dB gain advantage!

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COM-3 $279.95

2 WAY RADIO SERVICE MONITOR

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RSG-10 $249.95

SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • – 130 to + 10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

FREQUENCY COUNTERS

CT-70 7 DIGIT 525 MHz | **CT-90 9 DIGIT 600 MHz** | **CT-125 9 DIGIT 1.2 GHz**

Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one-year warranty on parts and labor. We take great pride in being the largest manufacturer of low-cost counters in the entire U.S.A. Compare specifications. Our counters are full-featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry, and durable high quality epoxy glass plated-thru PC board construction. All units are 100% manufactured in the U.S.A. All counters feature 1.0 ppm accuracy.

NEW CT-250 2.5 GHZ

ACCESSORIES FOR COUNTERS

Telescopic whip antenna—BNC plug, WA-10	$11.95
High impedance probe, light loading, HP-1	$16.95
Low-pass probe, audio use, LP-1	$16.95
Direct probe, general purpose use, DC-1	$16.95
Tilt bail, elevates counter for easy viewing, TB-70	$9.95
Rechargeable internal battery pack, BP-4	$9.95
CT-90 oven timebase, 0.1 ppm accuracy, OV-1	59.95

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	< 25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	< 50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	< 10 mV to 150 MHz < 150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	< 25mV to 50 MHz < 15 mV to 500 MHz < 100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	< 25 mV to 50 MHz < 10 mV to 1 GHz < 50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$239.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	< 50 mV	Convert your existing counter to 1.5 GHz		$89.95

SPEED RADAR $89.95 complete kit $G-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes delivery. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.

PR-2, wired, includes AC adapter	$59.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.

PA-1, 40W pwr amp kit	$29.95
TR-1, RF sensed T-R relay kit	$ 8.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88–108 MHz FM band up to 300' except for hi power FM-4 that goes up to ½ mile.

FM-1, basic unit	$ 5.95
FM-2, as above but with added mike preamp	$ 7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away	$14.95
FM-3, complete unit includes case, battery, switch, antenna, and built-in condensor mike. Excellent fidelity, very small, kit	$16.95
FM-3WT, as above, but fully wired and tested	$19.95
SMC, miniature sensitive mike cartridge for FM-1, 2, 4	$ 2.95

MICROWAVE INTRUSION ALARM

A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC. Complete kit MD-3 . $16.95

MUSIC MACHINE

Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.

Complete kit, MM-5	$24.95
Case + knob set, CMM-5	$12.95

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.

Complete kit, PC-1	$49.95

LO NOISE PREAMPS

Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40

Each kit	$17.95

TONE DECODER

A complete tone decoder on a single PC board. Features: 400–5000 Hz adjustable range via 20-turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.

Complete kit, TD-1	$5.95

VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.

VS-1 kit	$6.95

TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!

PB-1 kit	$14.95

NEW

SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.

SP-1	$29.95	Case-CSP	$12.95

TICKLE STIK

A shocking kit! Blinking LED attracts victims to pick up innocent-looking can—you watch the fun! Ideal for office desks, parties, nosey know-it-alls!

TS-4 kit	$9.95

LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug."

Transmitter + receiver set, LB56	$19.95

FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!

FR-1 kit	$14.95

SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.

BN-9 kit	$5.95

BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.

SA-7 kit	$14.95

NEW

FANTASTIC 2M FM TRANSCEIVER

SYNTHESIZED—NO CRYSTALS TO BUY!

$149.95

Ramsey breaks the price barrier on 2 meter rigs! Here's the ideal rig for field days, hamfests, vacations, second cars and packet (it even has dedicated packet connections). Six expandable diode-programmed channels, 5W RF output, sensitive dual conversion receiver and EASY assembly. Why pay more for a secondhand old rig when you can make your own for less. Have some fun with your own truly AMERICAN-MADE FM rig! This kit comes complete except for the case, mike and speaker—ICOM or equal speaker-mikes plug right in. Add our own beautiful case set for a professional factory look.

FTR-146 kit	$149.95
FTR-146-C metal case & knob set	$24.95

2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.

PA-10 2 MTR POWER BOOSTER (10 X power gain) Fully wired & tested	$79.95
PA-20 220 MHz POWER BOOSTER (8 X power gain) Fully wired & tested	$79.95

QRP TRANSMITTERS

20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.

Your choice of bands (Specify band: QRP-20, 30, 40 or 80)	$29.95
Matching case & knob set, CQRP	$12.95

HAM RECEIVERS

20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in QST and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.

Your choice of bands (Specify band: HR-20, HR-30, HR-40, HR-80)	$27.95
Matching case & knob set, CHR	$12.95

E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.

CW-7 kit	$24.95
Matching case knob set, CCW	$12.95

2, 6, 10 MTR, 220 FM RECEIVERS

Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.

FM communications receiver kit	$29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)	
Matching case & knob set, CFR	$12.95

ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!

AA-7 Kit	$24.95
Matching case & knob set, CAA	$12.95

SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.

SS-7 kit	$29.95
Matching case & knob set, CSS	$12.95

FM STEREO TRANSMITTER

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!

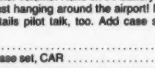
FM-10 kit	$29.95
Matching case set, CFM	$12.95

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SRI	$27.95
Shortwave converter kit, SCI	$24.95
Matching case set for SRI, CSR	$12.95
Matching case set for SCI,CSC	$12.95

AIRCRAFT RCVR



Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

AR-1 kit	$24.95
Matching case set, CAR	$12.95

TERMS: Satisfaction guaranteed, examine for 10 days. If not pleased, return in original form for refund. •Add 7% (up to a maximum of $10) for shipping, handling and insurance. •For foreign orders add 15% for surface mail, •COD (USA only) add $3.50. •Orders under $20, add $3.00. •NY residents, add 7% sales tax. •90 day parts warranty on kits, •1 year parts & labor warranty on wired units.

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RAMSEY ELECTRONICS, INC. 793 Canning Parkway, Victor, NY 14564

CIRCLE 34 ON READER SERVICE CARD

73 Review *by Larry R. Antonuk WB9RRT*

Startek International Inc.
398 NE 38th St.
Ft. Lauderdale FL 33334
Telephone: (305) 561-2211; (800) 638-8050
Price Class: $250 for the basic unit; $9-$39 for the optional accessories.

Model 3500 Frequency Counter

Speed, accuracy, and ease in a shirt-pocket unit.

In the old days, you could tell a lot about a ham radio operator just by looking at his workbench. A fast glance over a ham's tools and test equipment can quickly determine his level of expertise and commitment. What do you see? A cereal box DC voltmeter and a CB SWR bridge? (Hmmm. Not too serious.) A decent meter, an audio signal generator, and a few home-brew gadgets? (Getting closer.) Eight or 10 big mysterious boxes, an oscilloscope or two on a cart, and a big RF frequency counter? (Aha! A real hard-core.) A digital voltmeter and a shirt-pocket frequency counter...

A shirt-pocket *what*? A shirt-pocket frequency counter. Those of us who grew up with 80-pound boat anchors sporting dancing Nixie tubes and prescalers may find it hard to believe, but the Startek International Model 3500 does indeed fit in a standard shirt pocket (as does the whole Startek line). Not only does the 3500 take up less space than your old buddy, but it's faster, easier to use, and more accurate. How do they do it?

Micro Package—Big Features

The answer, of course, is modern technology. The Model 3500 uses a combination of LSI and MMIC chip technology to produce a device that is extremely sensitive over a wide frequency range. Like most counters, the unit has selectable ranges, in this case 10 Hz to 12 MHz and 10 MHz to 3.5 GHz. Unlike older models, the 3500 selects a high impedance mode for the low range, and a 50 ohm impedance for the high range. This eliminates the problem that often occurs when trying to measure the frequency of a low-level oscillator in a radio. A standard counter will load down the circuit, killing the oscillations. Even worse, in some situations the counter will load down the circuit just enough to vary the actual frequency of the oscillator. This produces a respectable-looking but entirely incorrect reading. The high impedance mode fixes both of these problems.

The 3500 and the entire Startek line all use eight-digit LED displays. The debate over LEDs versus LCDs will probably go on forever, but I prefer LEDs. The majority of radio service work is done in dimly lit areas—basements, attics, hilltop radio shacks—where the LED outperforms the LCD hands down. In addition, in the few instances where the unit needs to be used outdoors, the display is easily shielded.

The Startek Model 3500 frequency counter.

The display resolution changes along with the GATE switch. Using the EXT gate position, you can resolve frequencies down to 0.1 Hz on the low range and 10 Hz on the high range. One nice feature of the 3500 is the ability to select three different gate times (see the table for gate times versus resolution). A DISPLAY HOLD feature locks the active readout for later reference or recording. Maximum input levels are stated to be +10 dBw and +15 dBm for the low and high ranges, respectively. These values figure out to 10 watts and 30 mW, respectively. This means that the 3500 has a high degree of overload protection, but it doesn't mean it's bulletproof. It will still die if you key your mobile rig directly into it. However, it's less likely to become "deaf" from people waving handhelds next to its antenna.

Sensitivity

Sensitivity figures for the 3500 are shown in the table. The review unit exceeded these values across the entire range of frequencies. This is impressive enough from a technical standpoint, but what it means in terms of actual use is even more exciting.

The days of counter preamps are long gone. Not only are the Startek counters sensitive enough for any general troubleshooting, they also work well for remotely monitoring transmissions. The 3500 was able to reliably count the frequency of a 2 meter, 5 watt handheld, using a rubber ducky antenna, at 150 feet. A 50 mW signal operating into a one-foot whip could be read at 20 feet. This characteristic makes the counter a very versatile tool. Public service monitoring, surveillance work, intermod and interference problems, transmitter hunting—several applications immediately become apparent. (If you've always wondered what the frequency was at the drive-in window of Bob's Taco Stand, this is the instrument for you.)

Unlike most RF counters, this unit works well down to 10 Hz. This makes it useful for a variety of audio functions as well—counting CTCSS (PL) tones, checking DTMF microphone frequencies, and verifying two-tone encoder tones.

Features

The Model 3500 comes with the basic supplies needed for day-to-day use: a built-in NiCd supply and a plug-in wall charger. (A telescoping antenna to fit the BNC input jack is available as an option.) Optional accessories include a carrying case, different probes for "in circuit" testing, and a rubber duck style antenna. The NiCd pack will power the unit for four hours before recharging.

The idea of servicing a service instrument is never foremost on one's mind when buying one, but the Startek counter carries a one-year parts and labor warranty. Due to its size, the unit will spend most of its time in a relatively safe corner of a toolbox or coat pocket, but

Model 3500 Specifications

Range	Overall	10 Hz–3.5 GHz		
	Lo Range	10 Hz–12 MHz		
	Hi Range	10 MHz–3.5 GHz		
Display	8 red LED digits, 0.28″ (height)			
	Auto decimal point placement			
Resolution & Gate Times	Lo Range	Gate	Fast	10 Hz 0.1 sec.
			Slow	1.0 Hz 1.0 sec.
			Ext	0.1 Hz 10.0 sec.
	Hi Range	Gate	Fast	1.0 kHz 0.25 sec.
			Slow	100 Hz 2.5 sec.
			Ext	10 Hz 25.0 sec.
Time Base Clock Frequency	Lo Range	10.000000 MHz, TCXO		
	Hi Range	3.906250 MHz, TCXO		
Accuracy to Calibration	±0.0001% +1 count LSD, 25–35 DEG/C typ. (± 1 ppm overall)			
	Xtal aging	1 PPM/year typ.		
Signal Input	Lo Range	1 megohm impedance	22.0V max.	
	Hi Range	50 ohm impedance	1.2V max.	
Sensitivity (Typical)	Lo Range	1–10 mV RMS		
	Hi Range	10 MHz–2 GHz	1–10 mV RMS	
		2–2.4 GHz	10–20 mV RMS	
		2.4–3 GHz	15–50 mV RMS	
Power Required	9–12 VDC (9 VDC @ 300–500 mA adaptor), auto polarity			
Battery Operation	3–5 hrs. usage, 16 hrs. full charge			
	600 mA/hr. Panasonic NiCd batteries			

it's rugged enough to take a fair amount of dropping. (The author's Model 1500 spent most of the summer up towers and on rooftops aligning the 230 MHz IF of 23 GHz microwave lines, and took quite a few tumbles in the process—a real testimony to the physical quality of these counters.)

The Startek 3500 is inexpensive enough and portable enough to be used for a variety of purposes. Frequency netting and calibration, general audio and RF troubleshooting, providing accurate readouts for older RF signal generators—whatever the use, the 3500 will give a vast amount of performance at a very modest price. The next time you're at a hamfest and someone wonders what frequency that old commercial rig is on, just reach into your shirt pocket. 73

The Heli-Hat Antenna

An 18-inch wonder for 10–17 meters.

by J. Frank Brumbaugh KB4ZGC

What is compact, portable, and efficient? Covers 17 through 10 meters? Is omnidirectional, with low angle radiation? Reduces QRM, QRN, and harmonics? Has one-knob tuning for low SWR?

More and more hams find themselves living in subdivisions, apartments, and condominiums where deed and building restrictions make normal antenna installations impossible. Hams in mobile home parks, and those ranging the country in motor homes, have few options for useful antennas other than loaded vertical whips—mobile antennas. These are useful for the higher HF bands, but commercial versions are very expensive. What they need is an antenna with the above features.

Although I now have a 40 meter dipole for HF use, there have been many times during my 40-plus years as a rag-chewer when I lived in locations where even a whip antenna on a balcony was frowned upon. I experimented with many different antenna configurations. Some worked quite well. Others were duds. The more-or-less standard dipoles and quarter-wave wires, even bent to fit the available indoor space, generally gave satisfactory results when properly tuned. However, even small gauge wires strung around a small apartment were sometimes noticed and questioned by landlords, requiring elaborate explanations—lies—which seldom were believed. What was needed was a compact, effective HF antenna that could be easily hidden in a closet or attic when "official" visitors were expected.

Such an antenna should be of a size that could easily be transported in an automobile and rapidly set up in a motel room, or even put on top of the car for fixed mobile operation on Field Day. The Heli-Hat Antenna was my solution to this problem. It has all the features I opened this article with!

Originally designed before WARC to operate on 10 and 15 meters, it has been used since then on 17 and 12 meters, and results have been most satisfactory. This antenna may well be of interest to other hams with similar antenna problems, or as a "quick and dirty" Field Day antenna.

Heli-Hat Antenna

The antenna, illustrated schematically in Figure 1, covers the 17, 15, 12 and 10 meter bands. It includes one-knob tuning so SWR can be reduced well below 1.5:1—usually 1.1:1 or 1.2:1, making it compatible with modern solid-state transceivers. It is compact, fitting into a space approximately 18 inches high and 18 inches in diameter. With the top hat removed it takes up about as much space as two loaves of bread staked end-to-end.

Table. Taps vs. Frequency

Band, Meters	Tap	SWR
17	7	1.1:1
15	7	1.2:1
12	6	1.2:1
10	6	1.1:1

Note: Tap points measured from bottom of helix. The 10-meter tap is for 28.4 MHz and may vary at higher frequencies. Taps for other bands are for centers of bands.

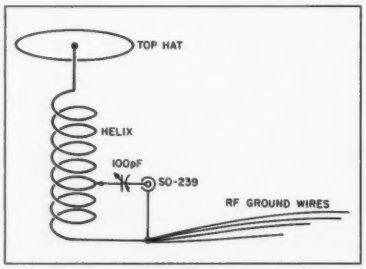

Figure 1. Heli-Hat antenna schematic diagram.

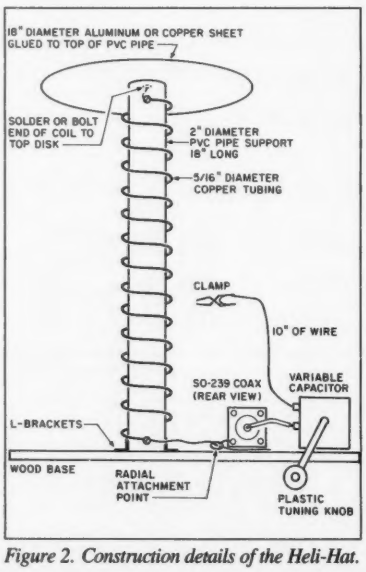

Figure 2. Construction details of the Heli-Hat.

Basically, the antenna is a tuned, top-loaded helix. A portion of the base of the helix, tuned by a 100 pF variable capacitor, resonates at the operating frequency and simultaneously presents a nonreactive 50 ohm load to the transmitter or transceiver. The upper portion of the helix is tuned by the effective capacitance of the top hat at the operating frequency. The entire antenna structure radiates.

This is a high-Q antenna, so it exhibits a relatively narrow bandwidth. This requires slight adjustment of the tuning if a large frequency excursion is made, especially on the 15 and 10 meter bands. A major advantage of such a high-Q antenna is that it rejects any harmonic energy which may be present on transmit, and on receive it reduces the level of signals near the operating frequency in a manner similar to the way a peaked filter functions. Not only will this antenna reduce QRM, it also reduces QRN to a great extent because of its narrow bandwidth.

The base of the helix must be grounded for RF. In most indoor installations this can be best accomplished by attaching open-ended quarter-wavelength wires to the ground connection, a solder lug on one of the screws holding the RF connector to the antenna base. Ground wires can be stretched out while operating, and rolled up and stowed with the antenna when not in use.

For operation on all four HF bands, the four wires should be cut to 13 feet 7 inches; 11 feet 7 inches; 9 feet 10 inches; and 8 feet 6 inches, respectively, for the 17, 15, 12 and 10 meter bands. Four separate insulated wires can be used; or two pairs of 2-conductor speaker wire, or even a length of 4-wire telephone cable such as that used indoors. Each wire should be cut to the length specified, and one end of all wires connected to the ground lug on the SO-239 RF connector on the antenna.

Continued on page 35

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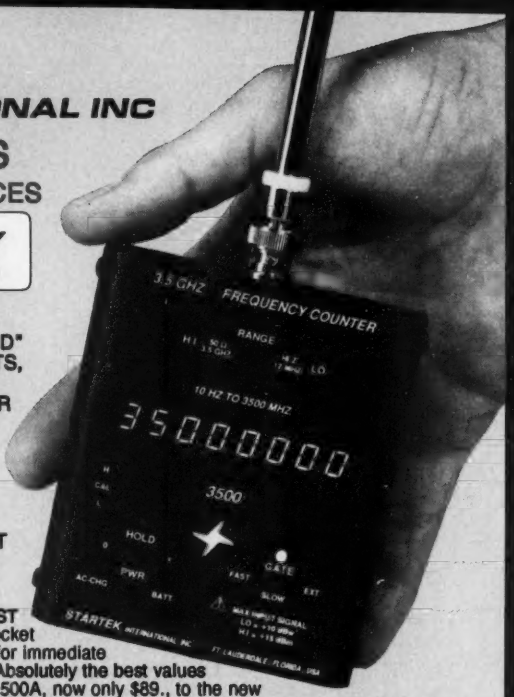

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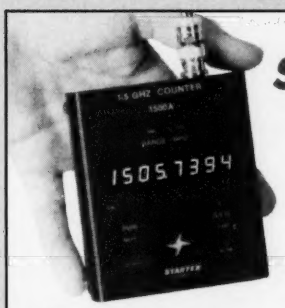

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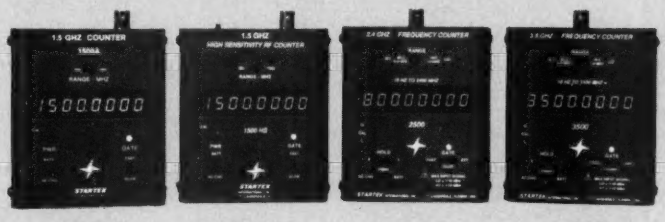

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Continued from page 32

WARNING: *When transmitting, the entire antenna structure as well as the open ends of the ground wires will exhibit high RF voltages which can produce burns if touched. Be certain your installation is protected from being touched by children or pets.*

Finding The Parts

New copper tubing is rather expensive, but the length required should not break any ham's budget. Scrap tubing, copper or aluminum, is often available for little or nothing at businesses involved in manufacturing and installation of refrigeration and heating/air-conditioning systems. The tubing I used was obtained from an air-conditioning installer for $2.00. It is also often possible to locate a sufficient length of cable TV hard-line—spool ends containing as much as 80 or 90 feet are usually discarded—and if you explain your intended use to one of the technicians, you probably can get as much as you need free of charge. Although copper tubing is best, aluminum can be used in constructing the Heli-Hat antenna.

The 100 pF variable capacitor I used has 0.03-inch plate spacing, which is OK for up to 100 watts. For 500 watts a plate spacing of 0.05 inches is recommended, and up to 0.1-inch spacing for maximum legal power. My capacitor came from the lowest depths of my junk box. It is odd, with trapezoidal-shaped stator plates, removed long ago from some esoteric military "boat anchor."

Fair Radio Sales, P.O. Box 1105, Lima OH 45802, has a broad selection of surplus variable capacitors at prices ranging from $1.25 to several dollars. (New variable capacitors bear prices that equal a day's wages or more! Surplus is better.) However, before spending scarce dollars, check with local hams and the flea markets at hamfests for a suitable capacitor. Also, Radiokit at P.O. Box 973, Pelham NH 03076, tel: (603) 635-2235, carries a number of suitable capacitors. Two good candidates are their model number 284130 for higher power, and number 23100MK for under 100 watts.

Aluminum sheets two feet square are often available in hardware stores as "Reynolds® Do-it Yourself" supplies. Hardware and building supply stores also usually have two-foot-wide aluminum flashing for sale. Either will be suitable for the top hat, which is 18 inches in diameter.

Scrap PVC pipe and wood for the antenna base may often be found in scrap piles behind hardware and building supply stores, although the short length of pipe needed should cost less than a dollar purchased new. It can be either larger or smaller in diameter than that specified herein. Its only function is to provide stability to the tubing helix.

Construction

The helix consists of 15 turns of 5/16-inch copper tubing about 4-3/4 inches in diameter, with the turns evenly spaced over a length of 14 inches. The total length of tubing is about 19 feet. The helix was formed by winding around a cardboard tube about 3-1/2 inches in diameter, springing to its final diameter when removed from the cardboard. Ends of the tubing are flattened and drilled to accept long machine screws, then slipped over the PVC pipe and bolted through it. The pipe is about 18 inches long and about 2 inches in diameter.

NOTE: The dimensions given are those of my antenna. You may make any changes *within reason* in any of these dimensions. Tubing of larger or smaller diameter can be used; overall tubing length can be greater or a bit less. Helix diameter can be reduced and length extended. The result of such minor changes may change the position of the tap point for one or more bands but otherwise should make no important difference.

The top hat is an 18-inch diameter disc of aluminum sheet with an area of over 254 square inches. It need not be round as long as the area is close to 254 square inches. The effective capacitance of the top hat is important to both the frequency range covered and to the Q of the antenna.

The top hat can be attached to the top of the PVC pipe with epoxy or hot glue. A ground lug attached to the underside of the tip hat near the PVC pipe is used to connect a short wire jumper between it and the top of the helix.

The lower end of the PVC pipe can be mounted on a short piece of wood, plywood or plastic, using brackets and machine screws. It may also be attached with epoxy or hot glue, although this will not produce a very strong joint.

The tuning capacitor must have both rotor and stator plates insulated from ground because it is in series with the RF from the transmitter or transceiver and the tap on the helix. Either a length of insulating shaft or a large plastic knob must be used on the tuning capacitor shaft, which will be "hot" with RF. Mount the capacitor on the base near the PVC pipe.

An SO-239 RF connector can be connected to a bracket attached to the antenna base near the tuning capacitor. Mount a ground lug under two of the screws holding the connector on the bracket. Connect a wire jumper from one ground lug to the base of the helix. The other ground lug is the connection for the four RF ground wires mentioned earlier.

Connect a wire jumper between the center terminal of the SO-239 to either the rotor or stator of the tuning capacitor. Solder both connections.

Strip some insulation from both ends of a flexible stranded wire of AWG #16 or larger and about 10 or 12 inches long. Connect one end to the unused terminal on the tuning capacitor, and solder.

Connect a spring clip to the other end of this wire. An alligator or crocodile clip may be used, but a small spring clip of the type used on automobile jumper cables and battery chargers works best. This clip is used to establish the tap point of the helix for each band, and must make a solid, low resistance connection.

Operation

Attach the ground wires to the unused solder lug on the SO-239 connector and stretch them out more-or-less in a straight line. Using a coaxial jumper, connect the RF output of your transceiver or transmitter to the SO-239 on the antenna, providing your rig includes a means for monitoring SWR. If it does not, an SWR meter must be connected between the transmitter or transceiver and the antenna.

If you've followed the measurements given in this article closely, position the tap on the helix as indicated in the table. If your antenna differs in dimensions, the proper tap point must be determined experimentally.

Apply 10 to 25 watts to the antenna and adjust the tuning capacitor for the lowest SWR. In some installations it may be necessary to move the tap point on the helix one-half to one turn higher or lower to achieve an SWR of 1.1 or 1.2, although if the SWR is at least below 1.5:1, modern solid-state rigs will operate satisfactorily.

Monitor the SWR when you change frequencies or bands, and change the tap position and adjust the tuning capacitor as necessary to maintain low SWR.

Conclusion

The Heli-Hat antenna is omnidirectional and radiates much of the RF at the low vertical angles best for DX. It is a high-Q antenna with a narrow bandwidth around the operating frequency, resulting in the reduction of QRM and QRN on receive, and greatly reducing the level of any harmonic energy that might be present in the output of the transmitter or transceiver. It covers all four ham bands from 17 through 10 meters and is easily tuned for a very low SWR. The antenna is easily set up indoors or out, and is easy to conceal when not in use. It can, in many cases, be constructed wholly from scrap.

Although the Heli-Hat antenna was designed to cover only the four highest HF bands, theory suggests it also could be tuned on 6 meters, and possibly 2 meters as well, by tapping the helix closer to ground. Not having equipment for these bands, I was unable to check for operation on these frequencies.

Too, if the helix is made from a longer length of tubing, and perhaps has a larger top hat, it should be possible to extend the lower frequency limit to include the 20 meter band without making the antenna much larger.

Although the Heli-Hat antenna is not intended to compete with a 6-element monoband beam on a 100-foot tower, it will give a good account of itself on the four ham bands for which it was designed, especially on crowded bands where its high Q is a distinct advantage.

This antenna also can be a starting point for experimentally minded hams who may be interested in modifying it to cover other frequency ranges. 73

You may write J. Frank Brumbaugh KB4ZGC at 1812 Marilyn Ave., Bradenton FL 34207-4743. Please enclose an SASE if you request information.

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73 Review

by Bill Clarke WA4BLC

The Solarcon A-99 Antenna

A very economical vertical for 10–17 meters!

Figure. Diagram of the Solarcon A-99 antenna.

A while back I was reading one of the ham magazines and saw an advertisement that really piqued my interest. It said, "World's top performing fiberglass omnidirectional base station antenna," then went on to say that it operates 12–10 meters. This was too much to let pass by, so I sent for one.

The box arrived via UPS and inside were three pieces of fiberglass-covered tubular antenna. I also found an instruction sheet and a few other papers. I quickly went about getting the antenna into the air for testing.

Assembly

This antenna is easy to assemble. The three pieces screw into each other and the bottom of the antenna has a metal sleeve which is then attached to a tower, post, or mast with U-bolts. Coax is attached to a weather-protected connector in the center of the antenna's base.

For the first few days of evaluation, I bolted the antenna to an eight-foot-long, two-inch-diameter wood rod and tied it to the side of my tractor, which was then parked about 75 feet from the house.

I ran a piece of RG-8X from the antenna into the shack and tuned up on 10 meters. The band was semi-open so I called a CQ and was immediately answered. From there on I played DX the rest of the day. By the time the bands went out I had worked about 40 countries, all with nice QSOs. Most impressive for an 18-foot piece of white fiberglass.

On-the-Air

It worked fine on 10 meters. After all, that's right next to 11 meters (the A-99 was originally designed for the Citizens Band). It should work there. The SWR was below 1.2:1 below 29 MHz. The next day I operated on 12 meters (SWR 1.8:1) and was pleased to find that the antenna performed as well on 12 as it did on 10.

Towards the end of the day I became bored with 12 and decided to see what other surprises the A-99 held. I put the rig on 17 meters and heard all kinds of activity—the band was in very good shape.

The antenna loaded with a 2.5:1 SWR. My rig can handle this, but I smoothed it out with a tuner and went to calling CQ. Just like on 10 and 12 meters, I got responses from all over.

To make a long story short, I have now played with this antenna for about four weeks and have found that it works very well on 17 through 10 meters. It won't make it down to 20 meters or below, however.

My testing was done with and without the optional radial kit. I could find no particular difference in performance either way, although there were some very minor changes in the SWR curves.

A Best Kept Secret

In talking with European hams, I discovered that many of them were using CB antennas of one type or another, and that this practice was not only economical but easy as well, and prevented visual intrusion complaints from the neighbors. One chap claimed to have worked 214 countries during the past year with an antenna similar to the A-99.

Could it really be that bigger isn't always better? Could it be that in our search for simple and effective antennas, hams have overlooked the obvious? I doubt if I am crushing any rocks out there in the pile-ups, but I get my share of contacts with this antenna.

Alternatives to Spending $300+

Although most of the competing antennas do offer 20 meter coverage, they also cost two to three hundred dollars more than the A-99. I'm not sure if using 14.313 MHz is worth the extra cost!

High Points

- The recommended retail price for the A-99 antenna is a very modest $74.50 (cheap).
- There are no moving parts on the antenna to wear out.
- It comes in only three pieces which can be assembled in about that number of minutes (simple).
- It can be mounted on the ground, on a mast, or on a roof. I suppose it could even be hidden in a tree. In fact, you can paint it to match the tree if you wish!
- No radials! The entire structure is a little less than 18 feet tall and about an inch in diameter.
- A nice info sheet about installing antennas is included, bringing out some areas of safety that should be revisited from time to time.
- The manufacturer's warranty policy is excellent. If the A-99 fails, it will be repaired or replaced, except in cases of damage or misuse, with no specified time limit.

Recommendations

The A-99 is a very economical and easy means for gaining access to 10–17 meters and getting a good signal out. Feed it with RG-8X for power levels under 200 watts, and RG-8 for higher power levels.

Although I experienced no stray RF problems, I placed an RF choke of six or seven turns of coax about six inches in diameter immediately at the base of the antenna.

You may want to use an antenna tuner to keep the SWR under control for solid-state rigs. If you place the antenna out in the open away from obstructions, you will probably only need a tuner when operating on the 17 meter band. I tried a rig with an internal automatic antenna tuner and found it loaded up easily into the A-99 on any band between 10 and 17 meters. In fact, the automatic tuner made a wonderful companion for the A-99. For a manual tuner, any of the inexpensive tuners should do quite nicely.

By the way, my A-99 is mounted on a 1-1/2 inch diameter galvanized pipe about four feet above ground level, and about 50 feet from the house.

Availability of the A-99

Solarcon has been manufacturing antennas for CB, cellular, and business users since 1975 and distributes worldwide. For the name of a dealer near you, contact Solarcon. 73

A-99 Specifications

The following is a modified list of specifications which reflect my test results:

Description	Fiberglass-covered vertical antenna
Height	17'8" (separates into 3 sections)
Bands	17–10 meters
Power limits	2 kW
Mounting	1-1/2" mast max.
Grounding	DC grounded
Useful radiation angle	<20 degrees 10–17 (as plotted with ELNEC)
Radials	Optional, but not needed
Safety	CPSC shock hazard standards to 14,500 volts

Gain: About 0 dBd (unity gain, compared with a dipole)
SWR: <1.2:1—10m (under 29 MHz) • <1.8:1—12m • <2.5:1—17m •

NOTE: The SWR may vary depending on your antenna location.

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Order #	Price	Output Pwr. (W)	Input Pwr. (W)	Frequency Range (Mhz)	Gain db/Mhz	*Package
MRF212	19.95	10	1.25	136-174	9/175	145A-09
MRF221	16.35	15	3.5	136-174	6.3/175	211-07
MRF224	17.75	40	14.3	136-174	4.5/175	211-07
MRF237	3.69	4	0.25	136-174	12/175	79-05
MRF238	15.95	30	3.7	136-174	9/175	145A-09
MRF239	16.95	30	3	136-174	10/175	145A-09
MRF240	17.49	40	5	136-174	9/175	145A-09
MRF240A	17.49	40	5	136-174	9/175	211-07
MRF247	24.75	75	15	136-174	7/175	316-01
MRF260	11.95	5	0.5	136-174	10/175	221A-04
MRF262	12.95	15	3.5	136-174	6.3/175	221A-04
MRF264	13.95	30	9.1	136-174	5.2/175	221A-04
MRF314A	35.95	30	3	30-200	10/150	145A-09
MRF315A	32.49	45	5.7	30-200	9/150	145A-09
MRF316	63.95	80	8	30-200	10/150	316-01
MRF317	64.95	100	12.5	30-200	9/150	316-01
MRF321	24.95	10	0.62	100-500	12/400	244-04
MRF327	63.95	80	14.9	100-400	7.3/400	316-01
MRF340	9.95	8	0.4	30-200	13/136	221A-04
MRF450A	14.49	50	4	14-30	11/30	145A-09
MRF454	15.49	80	5	14-30	12/30	211-11
MRF455A	12.69	60	3	14-30	13/30	145A-09
MRF458	19.95	80	5	14-30	12/30	211-11
MRF515	2.95	0.75	0.12	400-512	8/470	79-04
MRF555	3.49	1.5	0.15	400-512	10/470	317D-02
MRF557	5.49	1.5	0.23	806-960	8/870	317D-02
MRF559	2.25	0.5	0.08	806-960	8/870	317-01
MRF607	2.49	1.75	0.12	136-174	11.5/175	79-04
MRF627	9.95	0.5	0.05	400-512	10/470	305A-01
MRF629	4.49	2	0.32	400-512	8/470	79-05
MRF630	3.95	3	0.33	400-512	9.5/470	79-05
MRF641	20.49	15	2.5	400-512	7.8/470	316-01
MRF644	23.95	25	5.9	400-512	6.2/470	316-01
MRF646	25.95	40	13.3	400-512	4.8/470	316-01
MRF648	30.95	60	22	400-512	4.4/470	316-01
MRF650	29.95	50	11.7	100-500	6.3/470	316-01
MRF652	11.49	5	0.5	400-512	10/512	244-04
MRF654	19.95	15	2.5	400-512	7.8/470	244-04
MRF660	13.95	7	2	400-512	5.4/470	221A-04
2N3553	2.95	2.5	—	136-174	10/175	79-04
2N3866	1.25	1	0.1	100-400	10/400	79-04
2N4427	1.25	1	0.1	136-174	10/175	79-04
2N5641	16.95	7	1	30-200	8.4/175	144B-05
2N5642	18.49	20	3	30-200	8.2/175	145A-09
2N5643	19.95	40	6.9	30-200	7.6/175	145A-09
2N5944	11.95	2	0.25	400-512	9/470	244-04
2N5945	11.95	4	0.64	400-512	8/470	244-04
2N5946	14.95	10	2.5	400-512	6/470	244-04
2N6080	9.89	4	0.25	136-174	12/175	145A-09
2N6081	11.95	15	3.5	136-174	6.3/175	145A-09
2N6082	14.95	25	6	136-174	6.2/175	145A-09
2N6083	14.95	30	8.1	136-174	5.7/175	145A-09
2N6084	14.95	40	14.3	136-174	4.5/175	145A-09

Order #	Price	Output Power Watts (PEP/CW)	Input Power Watts	Gain db @ 30Mhz	Package
MRF401	13.49	25	1.25	13	145A-09
MRF406	14.99	20	1.25	12	211-07
MRF421	29.95	100	10	10	211-11
MRF422	35.95	150	15	10	211-11
MRF426	19.49	25	0.16	22	211-07
MRF427	16.95	25	0.4	18	211-11
MRF428	59.95	150	7.5	13	211-11
MRF429	44.95	150	7.5	13	211-11
MRF433	12.49	12.5	0.125	20	211-07
MRF448	72.95	250	15.7	12	211-11
MRF464	24.95	80	2.53	15	211-11
MRF466	34.95	40	1.25	15	211-07
MRF475	9.95	12	1.2	10	221A-04
MRF476	3.95	3	0.1	15	221A-04
MRF477	13.75	40	1.25	15	221A-04
MRF479	14.95	15	0.95	12	221A-04
MRF485	19.95	15	1.5	10	221A-04

DL110 14.95 Motorola RF Device Databook....Weight: 4.25 lbs.

Complete Line of DC Power Supplies to Convert 120VAC to 13.8VDC ±0.5VDC.

Standard Features Include:

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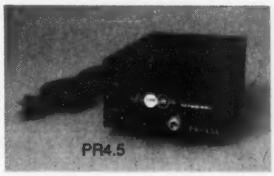

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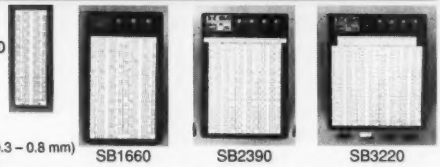
Order #	Price	ICS* (amps)	Continuous Duty (amps)	Fusing	Ripple Voltage	HxWxD (Inches)	Weight
PR4.5	32.95	4.5	3	Internal	0.1 Volt Max.	3.125 x 4.75 x 8.25	5 lbs.
PR7	44.95	7	5	Chassis Mount	0.15 Volt Max.	3.75 x 6.5 x 7.5	7 lbs.
PR10	64.95	10	7.5	Chassis Mount	0.15 Volt Max.	4.5 x 6.625 x 7.625	10 lbs.
PR15	89.95	15	12	Chassis Mount	0.15 Volt Max.	4.75 x 7.5 x 8.25	13 lbs.
PR25	126.95	25	20	Chassis Mount	0.15 Volt Max.	5.125 x 12.5 x 10.5	20 lbs.
PR40	179.95	40	32	Chassis Mount	0.15 Volt Max.	7.25 x 12.5 x 10	26 lbs.
PR60	249.95	60	48	Chassis Mount	0.15 Volt Max.	8.5 x 12.5 x 10	29 lbs.

***Intermittant Communications Duty (50% Duty Cycle)**



Features

- Color coordinates for easy recognition
- Insertion wire: 20-29 AWG (0.3 – 0.8 mm)
- Over 10,000 insertion cycles

Order #	Price 1-9	Price 10+	Dimensions (in.) L x W x H	Dist. Strips	Dist. Points	Terminal Strips	Terminal Points	Binding Posts
SB200	2.99	2.49	6.5 x 0.37 x 0.4	2	100 x 2	0	0	0
SB400	4.89	4.39	3.3 x 2.2 x 0.4	2	100	1	300	0
SB630	5.45	4.95	6.5 x 1.4 x 0.4	0	0	1	630	0
SB830	6.49	5.99	6.5 x 2.2 x 0.4	2	200	1	630	0
SB1360	12.49	11.99	8.5 x 3.9 x 1.2	1	100	2	1,260	2
SB1660	17.45	16.95	8.5 x 5.1 x 1.2	4	400	2	1,260	3
SB2390	22.49	21.49	9.1 x 6.9 x 1.2	5	500	3	1,890	4
SB3220	31.49	30.49	9.5 x 8.3 x 1.2	7	700	4	2,520	4

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Showdown in Portland

Discover the thrill of radiosporting.

by Joe Moell KØOV

In an ordinary DX competition, the contestants stay in their shacks in their own countries. They link with each other via the ether for only a few seconds, two at a time. Months later, they read the results in a magazine.

That's fun. But now, imagine an international amateur radio competition where the entrants spend a week together. They stay in one another's homes. They dine in large groups. Their families become good friends.

They challenge each other in the usual time-honored hamshack events, plus Morse contests and radio direction finding "foxhunts." The results are known immediately. There are opening ceremonies and a closing banquet, followed by misty-eyed good-byes.

More fun? You bet. At least 20 dB more, I'd say. Continent-wide radiosporting contests like this have been regular events in Europe and Asia for many years, but they are new to the USA. That's changing, thanks to the Friendship Amateur Radio Society (FARS).

FARS is a not-for-profit organization based in Portland, Oregon. It has a counterpart organization in Khabarovsk, a city of similar size in eastern USSR. Two years ago, hams from Portland went to Khabarovsk for a week of radiosporting activities.

This year it was Portland's turn to host. During the week after Memorial Day, FARS-USA welcomed hams to the second Friendship Radiosport Games (FRG-91). There were all the events usually found at a European/Asian radiosport festival, including DX contests, a CW competition, and the first internationally sanctioned foxhunt in the USA. On hand to compete were 10 Soviet, three Japanese, and 20 US hams.

First, the Foxhunt

In the USA, radio direction finding (RDF) contests are called hidden transmitter hunts, or T-hunts. They involve cars, trucks, and vans outfitted with strange antennas and blinking consoles. It's more like a road rally than a race.

International radiosport RDF, usually called foxhunting, allows no such luxury. It's all done on foot. Speed determines the winner. So, there's no place for the unfit (Photo A).

The site was Portland's Forest Park, a giant wooded labyrinth of trails, trees, and hills. The weather alternated between rain and sun. Somewhere in those 200 rugged acres were five yellow metal boxes, transmitting a few milliwatts on 146.565 MHz. Fox number one came on for one minute, then number two, and so on. To win the event, all you had to do was be the first to find all five, in numerical order, and get back to the start/finish line.

Sound easy? You try it! Even the winners, seasoned Northwest ELT team members and intrepid Southern California T-hunters, got a real workout (Photo B). Since each transmitter is on the air only 20 percent of the time, it's important to plot the bearings to each one often, and carefully triangulate on the maps provided.

Photo B. Kevin Kelly N6QAB won the foxhunt by finding all five transmitters on the two-mile course in less than one and a quarter hours.

It was a dual challenge: Both physical stamina and technical expertise were needed to win. Almost all contestants were headed for the liniment and foot baths after the rigors of this event.

Photo A. Yoshiko Yamagami JQ1LCW is a champion at "fox-teering," as it's called in Japan, but she had never used an American switched-antenna RDF set. Still, she finished fourth out of 15 entrants in the FRG-91 foxhunt.

Round-Robin DX

There was little time for recuperation after the foxhunt; the DX competition was the next day. Five of Portland's best-equipped hamshacks (W7NI, K2RAG, W7EJ, WR7D, and K7RO) rolled out the red carpet to the five international teams.

To insure that no team had an advantage or disadvantage because of the features of a particular station, the teams rotated. Each team spent one hour at each station, with an hour off for travel between operating periods. Thus, the contest period was nine hours, with only five hours actual on-air time.

By now, the competitors sensed that Murphy had connections with Old Sol as well as with the weatherman. Band conditions were anything but hot. Hopes by the Soviets and Japanese of racking up scads of contacts with their homelands were not to be realized (Photo C).

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CIRCLE 67 ON READER SERVICE CARD

Photo C. These Morse experts on the USSR-Red team made the most CW contacts in FRG-91. They are (front to back) Slava Alexandrov UW0CD, Mikhail Zavarukhin UW0CN, and Igor Krivosheev UA0CZ, in the computer-filled shack of WR7D.

The three-page set of rules for the HF test included "counters" for countries and US/VE/JA prefixes. To insure accuracy, there was a three-QSO penalty for "busted calls," plus additional penalties for incomplete exchanges and invalid QSOs.

All logging was done on computers provided by FARS. The sponsors also provided assistants to enter calls into the computers in real time.

Pressing their home court advantage, US teams took the gold and silver (Photo D). A USSR team was in third place, despite having fewer total QSOs than the Japanese team. The JAs made no CW contacts, which put them at a major disadvantage in the convoluted scoring system.

Speedy Telegraphy

Friday night, it was time to take off to Seaside, Oregon, a coastal vacation spot 80 miles northwest of Portland, for the remainder of the events. The Sea-Pac convention that weekend gave the foreign entrants a chance to meet hundreds of US hams. It also attracted the Northwest's top CW operators to take them on.

After a leisurely practice session at 20 wpm, Mark Sinnard N6OPN cranked up the computer and let the dits and dahs fly for the high-speed receiving test (Photo E). By the end of the 35 wpm round, only three entrants were able to copy for a solid minute. Based on their accuracy in that round, the individual medal winners were selected.

But Mark wasn't through with his torture—it was time for the pile-up contest (Photo F). By this time, hunger and other activities had lured some of the worldclass CW experts out of the FARS room and onto the convention floor. There was a shortage of contestants, so I grabbed a pencil and a set of earphones, and sat down in one of the empty seats.

The pile-up tape began with a plaintive "QRZ DX" by W2NSD/1. (Now where have I heard that call before?) For the next six minutes, it was non-stop CW bedlam ringing in my head, as no less that 101 rare stations called poor Wayne. They were all on top of one another, at varying levels, with lots of noise and QRN mixed in.

What a mess! Somehow I managed to scribble down enough callsigns to stay out of last place. But my list had nowhere near the 34 calls that winner Jim Fenstermaker K9JF got. How does he do it?

There was no lack of entrants for the next event: CW sending. Even Dima Ornatsky, the 12-year-old SWL grandson of RW0CA, gave it a try. The Soviet sending style is much different from the traditional J-38 grasp of American hams.

Russian straight keys have a big knob on them and are placed at the very edge of the table. These fellows used their arms as much as their wrists. They did well, but couldn't top "Faster than Baudot" Dale Jones K5MM.

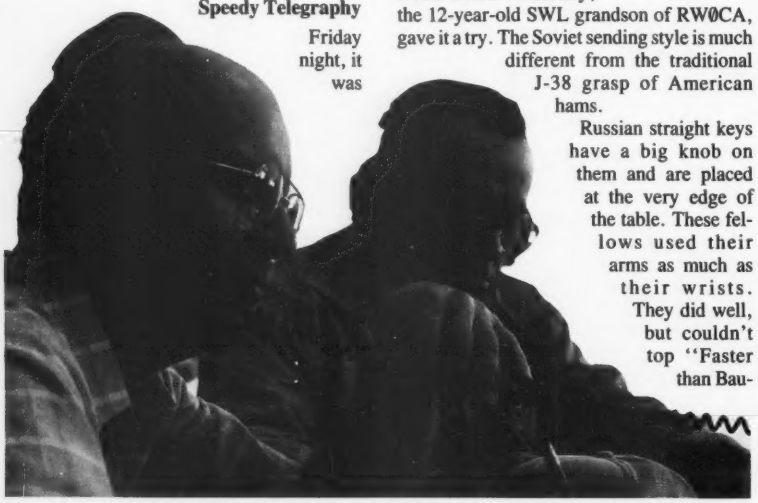

Photo F. Don Calbick W7GB (left) took second place in the brutal CW pile-up test. Harry Lewis W7JWJ (right) won the gold for high speed CW receiving.

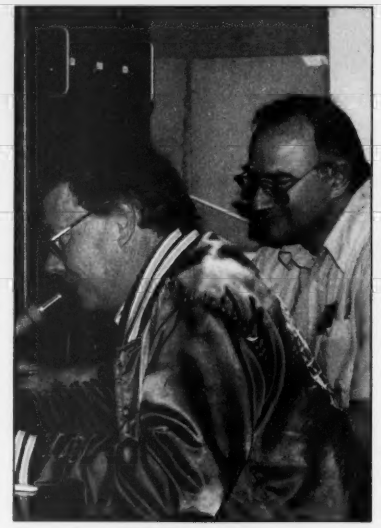

Photo D. At W7NI's super-station: A good balance of SSB QSOs, CW QSOs, and "counters" captured the gold for the US-Blue team, including Jim Fenstermaker K9JF (left) and Paul Kiesel K7CW (right).

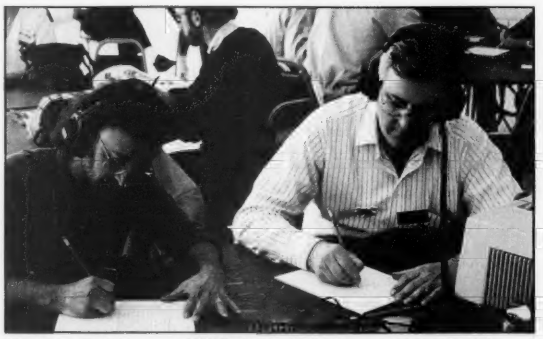

Photo E. Bob Bergert K0PB (left), Dale Jones K5MM (right), and J. Scott Bovitz N6MI (rear table) make fast CW receiving seem easy. Dale took first place and Scott took third.

When the final scores for all events were tallied, there was a tie for the gold between the Red and Blue teams from the USA. The USSR-Blue team took the bronze. But there was no talk of victory or defeat at the awards ceremony, just a celebration of the international camaraderie that amateur radio can provide.

East Meets West

To the Soviets, a trip to a US ham convention must seem like visiting another planet. They come from a country which does no manufacturing of ham gear. Soviet amateurs must build their own sets from whatever parts they can scrounge.

There was little scrounging to be done at the convention, because the Russian ruble is not an international currency. Fortunately, they had brought a few items for sale and barter, which were eagerly snapped up by the convention-goers.

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Kit $1095; w/t only $1295!

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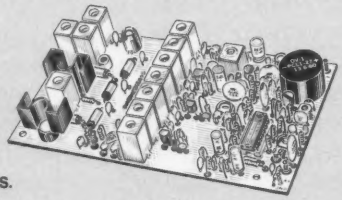

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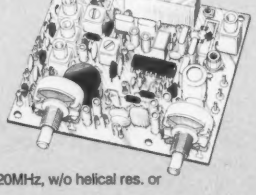

FM RECEIVERS: kits $139, w/t $189.
- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift.
- **R451 UHF FM RCVR,** similar to above
- **R901 902-928MHz FM RCVR.** Triple-conversion, GaAs FET front end.
- **R76 ECONOMY FM RCVR** for 6M, 2M, 220MHz, w/o helical res. or afc. Kits $129.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w/t $189.

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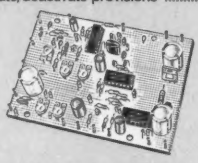
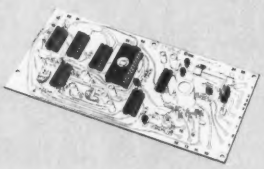
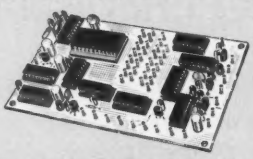


COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

CWID kit. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 .....$59



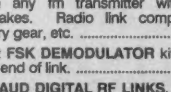
COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call $99



TD-2 TOUCH-TONE DECODER/CONTROLLER kit. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! $79

AP-3 AUTOPATCH kit. Use with above for repeater autopatch. Reverse patch & phone line remote control are std .$79

AP-2 SIMPLEX AUTOPATCH Timing Board kit. Use with above for simplex operation using a transceiver $39



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DE-202 FSK DEMODULATOR kit. For receive end of link. $39

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FEATURES:
- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
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***ONLY* $24**/kit, **$39** wired/tested

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Event	First	Second	Third
Foxhunt	Kevin Kelly N6QAB	Mike McCarter KA7NOO	Lewis Osborn KC7MZ
CW Receiving	Harry Lewis W7JWJ	Dale Jones K5MM	J. Scott Bovitz N6MI
CW Pile-Up	Jim Fenstermaker K9JF	Don Calbick W7GB	Al Rovner WA2TMP
CW Sending	Dale Jones K5MM	Mikhail Zavarukhin UW0CN	Vlad Gorelik RW0CA

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Kenwood USA	Handhelds
Ron Seese N6NBF	Fox Controllers

FRG-91 Team Medals

Event	First	Second	Third
Foxhunt	USA-Red (KA7NOO, KC7MZ, WB6JGV)	USA-Blue (N6QAB, N6MI)	Japan (JQ1LCW, JN1JPX, JR1WYB)
Operating	USA-Blue (W7RM, K9JF, W7WA, K7CW)	USA-Red (W3XY, WA7VTD, AI7B, WB7RFA)	USSR-Blue (UW0CA, captain)
CW Pile-Up	USA-Red (W7GB, WA2TMP)	USSR-Blue (UA0CZ, UW0CD)	USA-Blue (K9JF, N6MI, K0OV)
CW Sending	USA-Blue (K5MM, W7GB, W7VSE)	USSR-Red (RW0CA, UA0CDX, UW0CA)	USA-Red (WA7VTD, WA0DIM, W7JWJ)

quakes in Armenia, Soviet leaders are paying more attention to amateur radio as an emergency communications resource. At a special Sea-Pac convention forum, Mikhail Zavarukhin UW0CN and Gene Shulgin UZ3AU heard how hams in the USA are organized to assist these calamities. Gene is Technical Editor of *Radio*, a Soviet magazine for amateur radio experimenters. He is also Technical Advisor to the Soviet Amateur Radio Emergency Service (SARES). UZ3AU explained that Russian hams would like to emulate our ARES and RACES, but it would be very difficult. Equipment for HF bands is in very short supply. Mobile gear is almost non-existent. He is presently home-brewing some portable sets especially for future disaster use.

On VHF, it's even worse. Two meters is a seldom-used band. Mike and Gene said they knew of only one repeater. It's in Moscow, many miles from recent disaster sites. Shirt-pocket handhelds, an everyday item in the USA, are never seen there.

Oregon/Washington area hams want to help, and are collecting equipment and dollars to provide more repeaters for emergency use in the USSR. But Gene cautioned that radio equipment and money should always be sent to SARES by courier. If anything of value is mailed, they warned, it will never arrive at its intended destination.

The future is bright for international radiosporting events. FARS is already planning for the next Friendship Radio Games in Japan in 1993. If you start training now, you could become an internationally famous ham radio athlete!

Joe Moell K0OV is the "Homing In" columnist for 73 Amateur Radio Today. He won't walk a mile for a Camel, but he'll drive a thousand miles for a foxhunt. For more information about FARS and radiosporting, send an SASE to Friendship Amateur Radio Society, P.O. Box 13344, Portland, Oregon 97213.

Microprocessor Repeater Controller, Part II

This month . . . the audio board.

by John Bednar WB3ESS

Last month we looked at the microprocessor repeater controller board. This month, we will discuss the companion audio board which will complete the repeater controller. The audio board, when controlled by the microprocessor board, allows you to select between a variety of different audio sources in a very versatile configuration.

The Audio Board

During the layout of this board it quickly became apparent that there would be too many jumpers on a single-sided board. Therefore, the board was fabricated double-sided without plated through-holes. The latter reduces cost, but makes soldering necessary where traces meet on both board surfaces. Figure 1 is a simple block diagram of the audio board. Though it has many audio inputs and outputs, only a few are used in a basic repeater installation. These extra audio ports allow for future expansion.

The audio board was designed to have a flat frequency response down to about 100 Hz. This should be ideal for those who use discriminator audio from the receivers, and bypass the mike inputs on the transmitters. Depending on the hardware you use, some external frequency tailoring circuits may be necessary. For added convenience, the board was laid out to accept multi-turn pots which can be purchased with top or side adjustments. These pots are placed along the edge of the board so that either pot may be used.

Figure 2 is the schematic for the audio board. Single supply op amps, 4066 audio gates, and CMOS ICs are used throughout. Audio gating is provided so that unsquelched discriminator audio can be used from all receivers. Also provided on this board is a telephone interface, local speaker driver, and PL (private line) gating logic. The PL logic allows simple installation of PL to the repeater. The circuits on the board allow the repeater receiver audio to be gated to the phone, repeater transmitter, or link transmitter. Similarly, the link and auxiliary audio inputs are gated and connected to the three audio outputs. For added flexibility, a simple summing input was added at each output op amp for summing ID tone generators or any other capacitively coupled source. With all these input and output ports available, the framework for expansion is already in place.

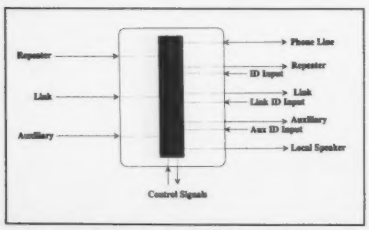

Figure 1. Audio board block diagram.

Audio Board Parts List

C1,11	0.047 µF ceramic	Digi-Key P4521
C2,7,14	0.1 µF ceramic	Mouser 140-CD12R6-104Z
C3,4,5,12	0.22 µF ceramic	Digi-Key P4529
C6,10	10 µF, 16V tantalum	Digi-Key P2038
C8	470 µF, 16V electrolytic	Digi-Key P6230
C9	optional	see schematic
C13	220 µF, 16V electrolytic	Digi-Key P6228
C15,16,17	0.47 µF, ceramic	Digi-Key P4533
D1,2	9V, 1W zener	Mouser 570-1N4739A
D3	1N4001	Mouser 331-PG4001
K1	12V DPDT relay, 960 ohm coil	Mouser ME431-ORZ-SH-212L
Q1	2N2222	Mouser 511-2N2222
R1,3,4,14,23,24,26, 27,28,29,30,31, 32,33,36	22k	Mouser 29SJ250-22K
R2,16,17,20,21	10k	Mouser 29SJ250-10K
R5,7,10,11,15,34,35	100k, 20-turn pot	Digi-Key see note #2 below
R6,8,9,12,13,22	100k	Mouser 29SJ250-100K
R18,19	2.2k	Mouser 29SJ250-2.2K
R25	560, 1/2W	Mouser 29SJ500-560
R37	50k chassis pot	Mouser 31VC405
R38	10 ohms	Mouser 29SJ250-10
R39	560 ohms	Mouser 29SJ250-560
R40	optional	see schematic
T1	600/600 ohm transformer	Mouser ME429-7216
U1,2,3	4001BE	Mouser 511-4001
U4,5,6,7	LM358N	Mouser 511-LM358N
U8	LM386N-1	Digi-Key LM386N-1
U9,10,11	4066BE	Mouser 511-4066
U12	100k 10-pin sip resistor	Mouser 266-100K
VR1,2,3	130V MOV	Mouser 570-V130LA1
PCB	double-sided	WB3ESS RCAB9-26-90-2 (see note below)
Card-Edge connector 31/62	Solder eyelet with mounting holes	Digi-Key S1312
Alternate connector	solder tail, no mounting holes	Radio Shack 276-1453

Notes: 1. All resistors are 1/4W unless specified otherwise. 2. For side adjust pots, order part number CFG15; for top adjust pots, order CEG15. 3. If IC sockets are used, be sure to purchase sockets that have long enough leads so that the traces under the sockets can be soldered on the top surface of the board. 4. Parts are available from Digi-Key Corp., 701 Brooks Ave. S., P.O. Box 677, Thief River Falls MN 56701-0677. Tel. (800) 344–4539. Mouser Electronics, 12 Emery Ave., Randolph NJ 07869. Tel. (800) 346–6873.

Etched and drilled microprocessor and audio PC boards are available for $19 each from John Bednar WB3ESS at 548 Cherryville Road, Northampton PA 18067. John can also supply a pre-programmed 8749H microcontroller IC for $19 (please indicate the repeater call as you want it sent, including the prefix "de" and suffix "/rpt" along with all spaces clearly marked). A limited supply of SSI202 touch-tone decoder ICs are available for $7. Please add $4 shipping for all orders. Foreign orders should include additional postage.

...The Perfect Solution

If you're living in an area with antenna restrictions, if you're tired of hassling with huge multi element yagis or if you're just looking for a compact, rugged, easy-to-use portable antenna that really *works*, the 150 watt IsoLoop 10-30 (MHz) HF Antenna is the Perfect Solution to your antenna problems.

The IsoLoop 10-30 has been redesigned to provide greater durability, lower SWR and extended frequency coverage. Because the loop is isolated from the feedline, your radiated power goes into the antenna, not into the shack. Efficiency is maximized because the new design has no mechanical joints and no assembly is required. **No ground plane or antenna tuner needed!**

The IsoLoop comes fully assembled complete with LC-2 Loop Controller (including signal strength LEDs) and 50 feet of control cable in a UPS shippable package.

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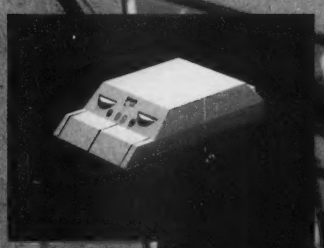

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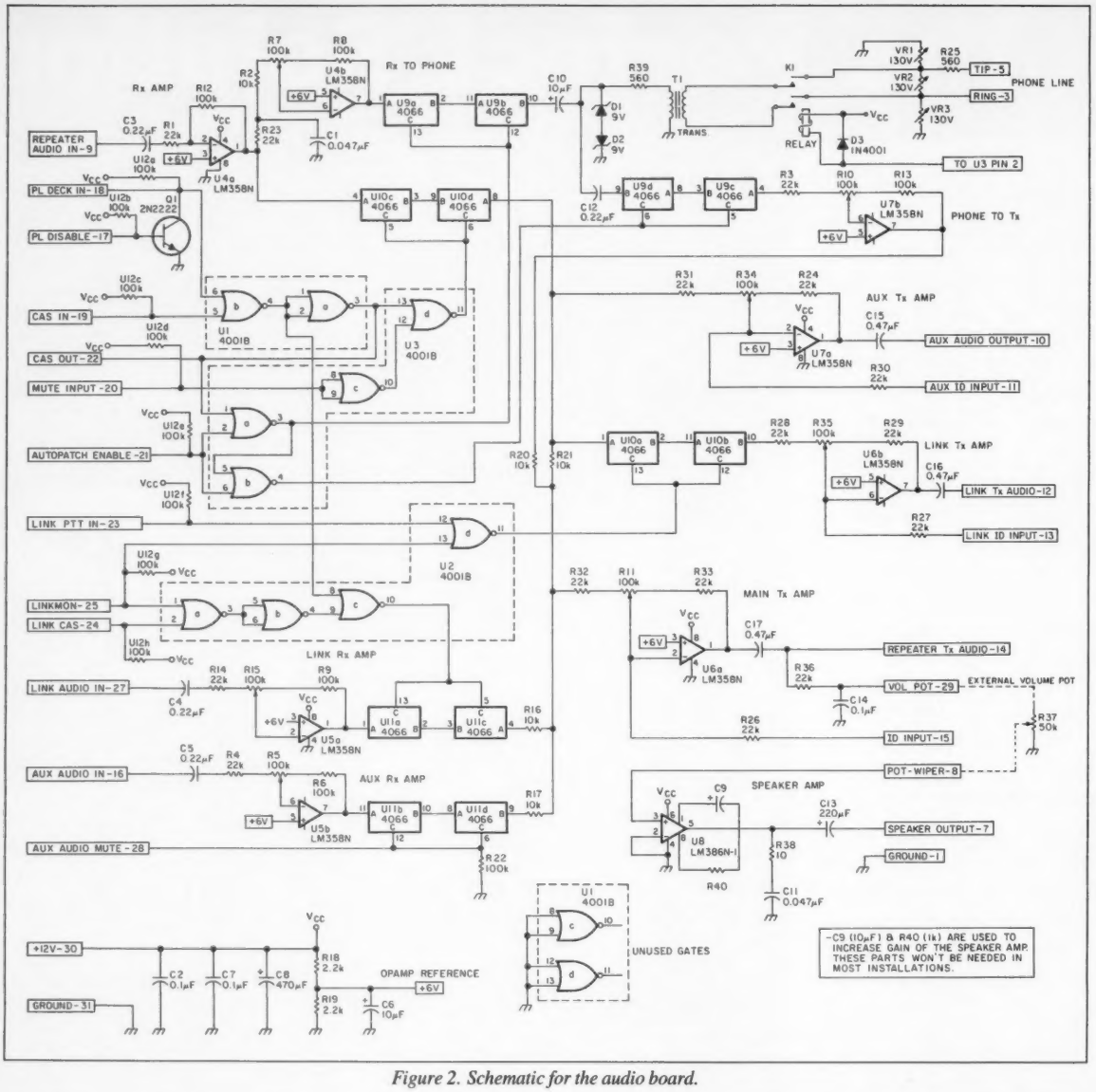


Figure 2. Schematic for the audio board.

For those repeaters without PL, pin 17 on the audio can be left disconnected and the repeater will function normally. To install PL on the repeater, connect an open collector output from a PL deck to the PL DECK IN pin of the audio board and a computer output to the PL DISABLE pin. Apply power, ground, and audio to the PL deck and the installation is complete. Remember, output #9 is ideal for this because the courtesy beep changes to let our users know that PL is required to use the repeater. When the repeater controller initially powers up, the computer board outputs are HIGH; therefore, PL will not be needed to initially operate the repeater. When the output is programmed low, the PL deck output will be gated with the receiver CAS to derive the CAS OUT signal for the computer board. When enabled, PL will be required for all repeater operation, including the entry of DTMF commands.

The speaker amplifier has an output power of approximately 0.5 watts into 8 ohms. Several owners have noticed that some LM386N ICs are unstable if the device input isn't connected to the volume control. Therefore, if you don't plan to use the speaker output, don't bother installing IC U8. The volume control (R37) is not located on the audio board because it's intended to be installed at a convenient location for speaker level adjustment.

How It Works

Although the audio board has many audio paths, its operation is fundamental. All op amps operate around a +6 volt DC reference applied to the noninverting pin of each amplifier. Capacitors are used at almost every input and output to interface to receivers and transmitters. An exception to this are the three ID inputs where external coupling capacitors *are* required. The computer board used one of these ID inputs, however the coupling capacitor is already present on that board.

The primary audio path is from the repeater receiver through to the transmitter. The main repeater receiver audio is connected to pin 9 of the board. Input amplifier (U4A) has a fixed gain of 4.5 which can be changed by varying resistor R12. The receiver audio is then passed through two series audio gates (U10C and U10D) which are controlled by three signals (the CAS IN, the MUTE signal from the computer board, and the PL DECK IN signal). Whenever the voltage is near zero on the control pin of any audio gate (pins 5 and 6 here), the audio is muted or switched off. When the audio passes through the audio gate (U10C and U10D), it then goes to three amplifiers (U6A, U6B, and U7A) and the speaker amplifier U8. Each output has an

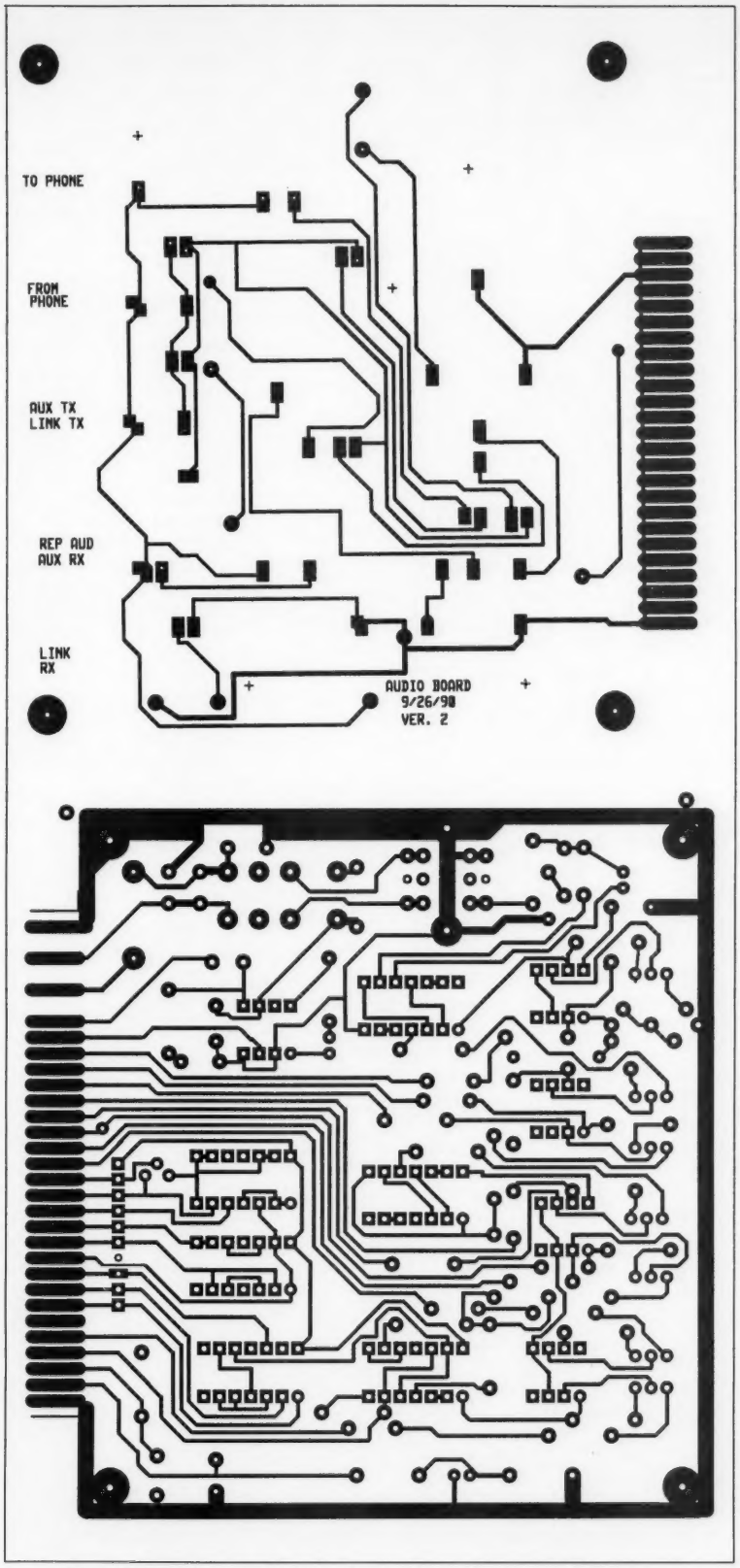


Figure 3. PC foil patterns for the audio board. (a) Top layer. (b) Bottom layer.

individual gain adjustment so each one can be adjusted separately.

The receiver audio from the input amplifier (U4A) also passes through an RC filter (R23/C1) to the adjustable phone amplifier (U4B). The gain of this stage is controlled by pot R7. If needed, the gain can be increased or decreased by changing the fixed resistor R8. The audio from op amp U4B is then passed through an audio gate to the telephone transformer. This audio gate is controlled by the receiver CAS IN signal, and the AUTOPATCH ENABLE from the computer board. When both the CAS OUT and the AUTOPATCH ENABLE signals are LOW, the audio from U4B is passed through to the telephone. Audio from the telephone is gated by U9C and U9D before passing to op amp U7B. The output of this op amp is connected to the main transmitter mixer which feeds the repeater transmitter and local speaker. The phone line is connected to the audio board with relay K1. It is controlled by the AUTOPATCH ENABLE signal. The audio board phone interface is protected by the 130 volt MOVs (VR1, VR2, and VR3), zener diodes (D1 and D2), and resistors (R39 and R25).

The remaining audio inputs LINK AUDIO IN and AUX AUDIO IN are similar to the repeater input, only differing in what controls the gate pin of the audio gates. Both of these inputs have an adjustable amplifier with individual pots. Similar to the other stages, the gain can be varied further by changing the fixed feedback resistor (R9 and R6) in each stage. The audio from these inputs is connected to the main transmit mixer.

The speaker volume pot is connected to the output of the main transmit op amp U6A. An RC filter (R36 and C14) is provided to roll off the audio for a natural sounding response. If necessary, capacitor C14 can be varied to make the speaker audio sound pleasant. The wiper of the volume pot feeds the speaker amplifier (U8) which can drive an 8 ohm speaker. Holes are provided in the circuit board for additional components (R38 and C11) to increase the gain of this speaker amplifier if necessary. I don't think these parts will be necessary in most installations.

Assembly

Before you begin assembly, here are some tips:

- Use a LOW TEMPERATURE soldering iron. Do not attempt to assemble this board with a high temperature soldering iron or gun.
- Like the computer board, watch out for an incorrect resistor SIP.
- You cannot install the telephone transformer and the MOVs backwards.
- All traces must be soldered on both sides of the board. The holes are not plated through.

Begin assembly by installing the components that have traces on the top side of the board. If sockets are used, make sure you leave enough room under the socket to solder the top board pads. Next, install the two jumpers. One jumper is near R1 and the other is near the common end of resistor pack U12.

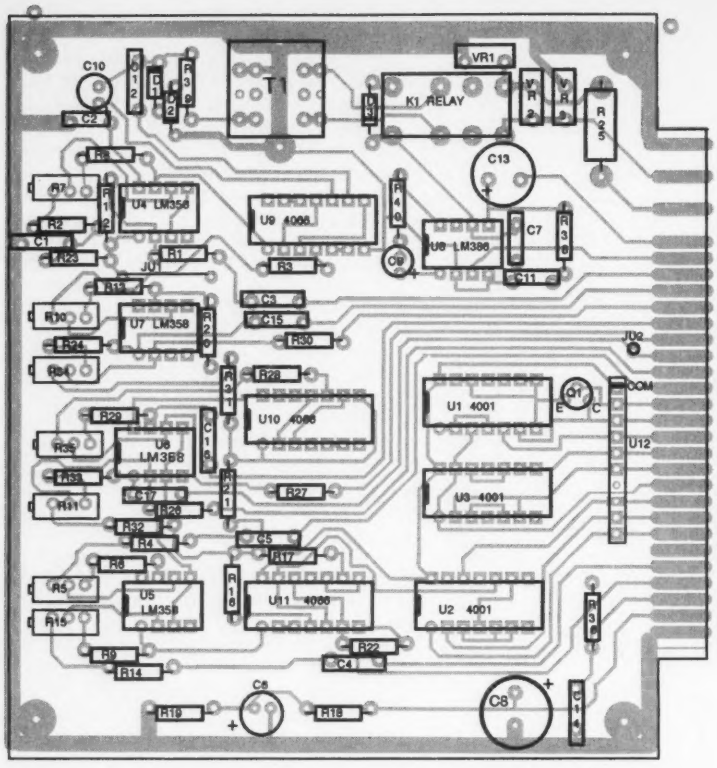


Figure 4. Parts placement for the audio board.

Complete the board by installing the remaining components.

Adjustments

See the diagram in Part I in the October 1991 issue. It shows the necessary connections to the audio board for a simple repeater installation. For simplicity, power and ground connections to both boards were omitted. The first test is to power up the repeater controller and listen for the power up ID on the speaker or the repeater transmitter. If necessary, the ID level may be adjusted with R20 on the computer board. Next, adjust the audio path from the repeater receiver through to the transmitter with R11. If there isn't enough gain, increase the feedback resistor (R12) of U4A to about 330–500k ohms. If too much audio is the problem, an external resistor divider should be used to pad down the level.

Once the main repeater path is adjusted properly, the ID level can be readjust-

Say you saw it in 73!

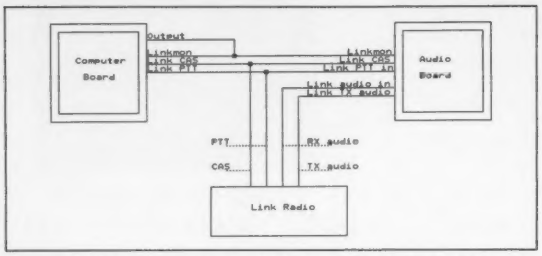


Figure 5. Block diagram of modifications to add a basic link to the repeater controller.

ed to the correct level. Follow this by adjusting the DTMF decoder level on the computer board. To set this level, simply transmit a DTMF digit and turn R17, on the computer board, 20% past the point where LED DS1 lights. If you notice that some digits light the LED and others don't, try increasing the level a little. If the increase in level doesn't help, the frequency response from the receiver isn't proper. On the computer board, try removing one end of C8 and/or C18 to see if an improvement in decoding can be made. If the operation gets worse, the values of C8 and/or C18 may have to be increased. If additional gain is needed for the DTMF amplifier, the value of R18 can be lowered to increase the gain. For reference, the SSI202 touchtone decoder will function with 15–20 mV rms of audio. This was measured from U3, pin 9, to ground while transmitting digit #1.

At this point, the repeater should function and DTMF commands may be entered. The final adjustments on the audio board involve setting the autopatch levels. Turn on the autopatch and adjust R10 for proper level from the phone line to the repeater transmitter. Next adjust R7 for proper levels to the phone line. If either adjustment is out of range, increase or decrease the appropriate feedback resistor (R8 or R13), to vary the the gain of the op amp. This should complete the adjustments necessary for a repeater with autopatch.

If the link or auxiliary ports are used on the audio board, the adjustments are identical to what has previously been done. Remember, the feedback resistor in each stage can be changed if needed. Before adjusting link audio, the LINKMON input will have to be pulled LOW for the audio gating to work properly. Also, the auxiliary audio input has a control signal which is connected to pin 28. This pin will have to be pulled HIGH (12 volts) for audio to pass through the audio gate directly after the op amp.

Adding Links

There are two methods of adding a link to this repeater controller. The first method is simple and requires little extra hardware, while the second method offers many advanced features, like being able to activate the link from the link frequency! This repeater controller was optimized for a single

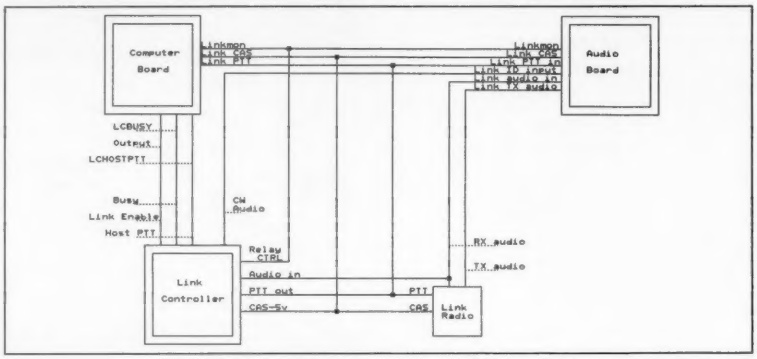


Figure 6. Modification for an improved link installation.

link or remote base. Adding multiple links is possible, but the external hardware must be built to switch the control and audio signals.

To add a simple remote base to the basic repeater, see Figure 5. There are only a few extra connections that have to be made to add this type of remote. A small amount of interfacing may have to be done to connect the PTT and CAS lines to the repeater controller. Although this is very attractive, the link can only be turned on and off from the repeater, plus there will be no ID on the link frequency. Also, before using the autopatch, the link will have to be turned off manually.

With some extra hardware, the link installation can be upgraded to address all of the above concerns plus add more features. This method incorporates the Link Controller, a previous project which appeared in the December '89 issue of *QST* ("A Repeater Linking Controller"). To make interfacing to the Link Controller easy, this repeater controller has several dedicated outputs. A diagram of this type of link can be found in Figure 6. Similar to the previous figure, it only shows the connections that have to be added to the basic repeater diagram. With only a few extra connections and a Link Controller board, the simple link can be upgraded to add features not found on the kilo-buck repeater controllers.

Ideas and Expansion Circuits

This section is a combination of ideas and suggestions for expanding the repeater controller. Some of these ideas have come from owners using the controller. I invite others to expand on these topics and submit their circuits to *73 Magazine* for others to use.

- A simple timer circuit may be built to add an autopatch timer to the repeater controller. Input #2 provides a way to remotely terminate the autopatch.
- Similarly, a long distance lockout circuit can be constructed to terminate the patch if a long distance number is dialed. An output pin from the computer board can be used to defeat this feature when long distance dialing is allowed.
- The superuser input pin on the computer board can be connected to a variety of sources. One interesting idea is to connect it to the output of a PL decoder. The owner would turn on PL while transmitting to enter superuser commands. Really sneaky, huh?
- If an output pin is connected to the superuser pin, an input pin can be connected directly to the superuser pin for a status readback of the DTMF priority. That way, owners can prompt the repeater controller to see what mode the controller is in.
- If the repeater doesn't have a link, the link courtesy beep can be used by connecting an unused output to the LINKMON input. By programming the output low, the link courtesy beep will be turned on. At the same time, the link PTT pin from the computer board will become active. This output can be used to key a PL encoder. With this connection, PL will be encoded on the repeater when a user is transmitting. Great for those handhelds that decode PL.
- The MUTE output from the computer board can be used to key a DTMF cover tone oscillator. The output of this oscillator can be fed into the ID INPUT on the audio board.
- The MUTE output signal with some logic can also be used to unkey the link transmitter while touchtones are being entered.

While writing this manuscript, I quickly became aware that this wasn't going to be a short article. In addition to what has already been presented here, I have generated two additional documents. One describes the controller commands in more detail, while the other provides a detailed functional pin-out description of each board. *[See author's address below.]*

I would like to acknowledge two people who assisted in this repeater controller project. Gary N3ECW coordinated the manufacture of both circuit boards, assembled all PC board models, and evaluated the performance of the completed audio board. In addition, Mike N3DZM provided considerable input during the design phase of the audio board. He also built the hand-wired audio board prototype, debugged it, and made the first repeater installation of this controller. Since a project like this takes so much time to complete, without Gary and Mike's help, it would certainly have taken much longer.

You may write John K. Bednar WB3ESS at 548 Cherryville Road, Northampton PA 18067. Please enclose an SASE for a reply.

A Simple 10-Meter Sideband Amplifier

Give your QRP rig a boost.

by Bruce Auld NZ5G

This sideband amplifier project is intended as a sequel to "A 10M Sideband Transmitter" (*73 Amateur Radio Today*, October 1991, page 14). It will give the rig a fighting chance among the crowds that we experience, even on 10 meters.

This amplifier generates between 5 and 10 watts PEP on 10 meters, depending on the input power, using a single 2SC1969 transistor, which is an inexpensive plastic device. In my version of the amplifier, 10 watts was available with an input of about 1.25 watts. When input power drops to 0.75 watts, the output drops to about 5 watts. The transmitter this is designed for should deliver between 0.75 and 1.0 watts PEP, depending on construction methods and the parts used.

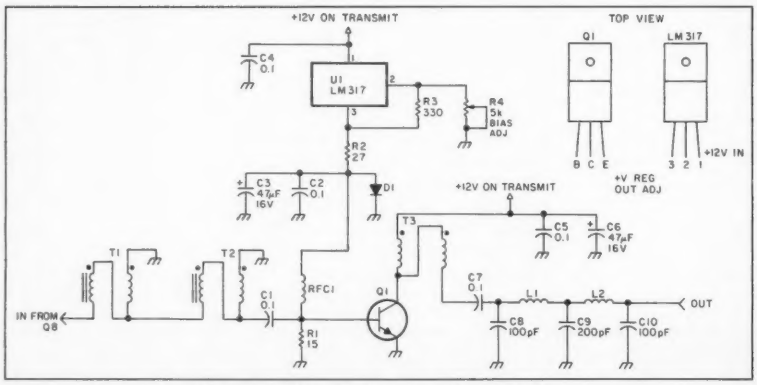


Figure 1. Schematic diagram of the amplifier.

Figure 1 is the schematic diagram of the amplifier. It is intentionally broadbanded, with two cascaded 4:1 transformers at the input to step the impedance down, and one 4:1 transformer at the output (see Figure 6 for winding details of T1, T2 and T3). The only components which are frequency-dependent are the LC combinations which make up the low-pass filter at the output. If you would like to construct this amplifier for other bands, only the low-pass filter components L1, L2, C1, C2 and C3 need to be changed (see Table 1).

The necessary forward bias for Q1 (0.7 volts) is set by D1, a garden-variety rectifier diode. I chose to use the LM 317 adjustable voltage regulator to drop the 12 volt supply down to around 5 volts before feeding it to the diode. Some circuits call for a single power resistor of 100 ohms or so in place of U1, but it must be rated at 10 watts or more because it dissipates a tremendous amount of heat. The circuit I used stays quite cool.

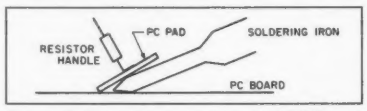


Figure 2. If you don't use an etched PC board you can make your own mounting pads and solder them to blank PC board material as shown.

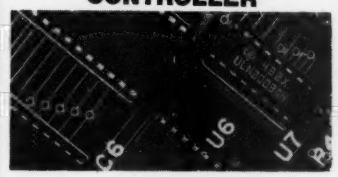
The scrutinizing constructor will notice that a 4:1 balun transformer is used on the collector of Q1. At some power output this impedance transformation ratio will perfectly match the 50 ohm input of the low-pass filter and the antenna. The collector impedance of this type of circuit is found by the following formula: $\mathbf{Z = Vcc^2 / 2 \cdot PO}$, where **Z** is the impedance, **Vcc** is the supply voltage, and **PO** is the power output. Applying the formula to the power outputs possible, you will see that at 5 watts, collector impedance is 14 ohms; and at 10 watts it is 7 ohms. Consequently, if the amplifier is to run at a power higher in the range specified, a 9:1 transformer may better match the collector to the low-pass filter. As a practical matter, I have tried 4:1, 9:1 and 16:1 transformers at this point with equal result. Solely for the sake of simplicity, I chose the former. Your application may justify another transformer.

Construction

Construction is performed over a ground plane of printed circuit board material, cutting out a small rectangular hole to accommodate the body of Q1. In my version of the amplifier, Q1 is mounted against the back wall of the transmitter, which acts as a heat sink. Because the tab of the transistor is common to the collector, insulate it from the chassis with a mica wafer. Do not forget silicon grease at this union to enhance heat transfer. I used the "ugly" construction method, mounting components on top of the board between half-inch square islands of double-sided PC board material affixed to the board. These pads can be fashioned easily with a hacksaw or hobbyist's drill with a cutting wheel, then soldered on the board, first by tinning the underside of the pad and its site on the board. Next, lay the soldering iron on the site to heat it and hold the underside of the pad on the topside of the soldering iron. When both surfaces are hot (two seconds will do), quickly remove the soldering iron and lay the pad on its site. The joint cools almost instantaneously and forms a permanent bond. I found that temporarily soldering a half-watt resistor to the top of the pad makes a nice "handle" for easy manipulation of the pad and precise placement on its intended site on the board (see Figure 2).

While I preferred not to use the conventional ferric chloride etching technique, those desiring an etched board may prepare the board by masking the entire board with tape or rubber cement and carving out narrow borders around the pads, exposing them to the etching solution. Figure 3 shows the foil pattern of the board and Figure 4 is the parts placement guide. A layout similar to this was

SRC-10 REPEATER/LINK CONTROLLER



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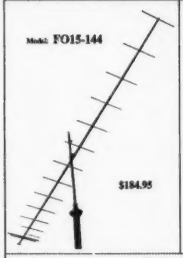

ELECTRICAL SPECIFICATIONS:

Measured gain	13.7 dBd
E-Plane beamwidth	31 deg
H-Plane beamwidth	33 deg
Sidelobe attenuation	
1st E-Plane	-17.5 dB
1st H-Plane	-15 dB
SWR	1.13:1 typical
F/B ratio	21 dB
Maximum Power	2000 Watts
Impedance	50 ohm

MECHANICAL SPECIFICATIONS:

Length	24ft. 8in.
Boom	1.5"OD 6061 T-6 Aluminum
Elements	1/4" Aluminum rod
Wind survival	90+MPH
Mast	up to 2" diameter
Element insulators	Black Delrin
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Coax connector	N-type
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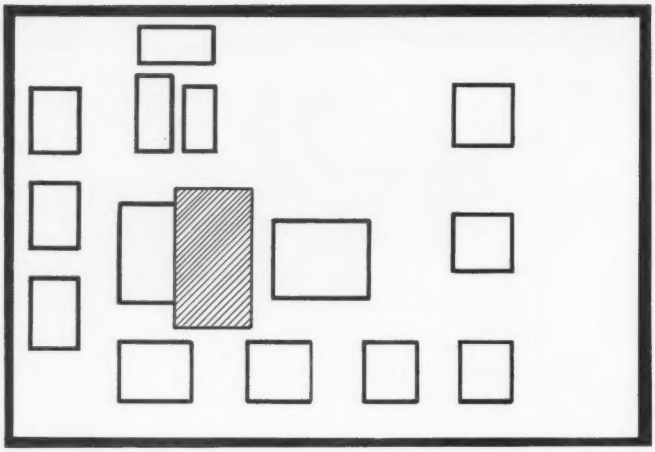

Figure 3. PC board foil pattern. Note: Dark lines are etched areas.

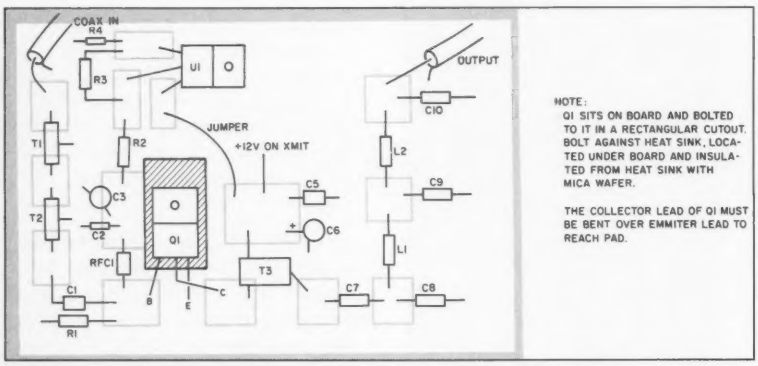

Figure 4. Amplifier parts placement. Cut out the shaded area of the PC board under Q1.

described in detail by Bill Heishman in his article "MOuSeFEet" (*73 Amateur Radio Today*, November 1990, page 36), with a full-size etching pattern. It is easily adapted to this purpose.

The supply voltage may be applied to the collector of Q1 continuously because the transistor is turned "off" until bias (from U1) and RF drive are applied. Consequently, the bias voltage is applied only during transmit periods. This keyed voltage may be obtained from relay K1 on the transmitter amplifier board. There is a PC solder pad and hole for this purpose.

In order to place the amplifier "in service," you must decide whether to leave it in-line permanently, or whether you want the option to switch it in and out to achieve high and low power output for your transmitter. If you prefer it in-line continuously, simply route the transmitter output (after the low-pass filter, but ahead of the antenna relay) to the amplifier, and the output of the amplifier to the relay. It is as simple as adding another stage of amplification to the transmitter. If you prefer selectable power levels, install the amplifier the same way, but include a double-pole, double-throw toggle switch between the transmitter low-pass filter and the amplifier input, as described below (see Figure 5).

Tune Up and Operation

Tune up and operation are simple. First, with transmit voltage applied to U1, but no RF drive, adjust the voltage appearing at pin 3 of U1 to approximately 5 volts. Next, confirm that D1 is properly limiting the voltage at the base of Q1 to 0.7 volts. Apply drive from the transmitter and check the output with a wattmeter. As with the transmitter, squeeze together or spread apart the turns of coils L1 and L2 in the low-pass filter of the amplifier for highest output.

I noticed that the system as a whole was less tolerant of impedance mismatches between stages and imprecise adjustments in the various stages in general. Oscillations appeared in the transmitted signal that were not present at the 1 watt level that originated in the transmitter. This glitch disappeared by making more precise adjustments in the transmitter. I recommend reducing audio drive with R27 and reducing the input to the mixer by rotating Q5's trimpot, R15. Also, readjust all the

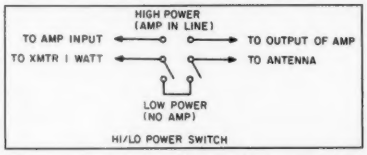

Figure 5. A double-pole double-throw switch can be used to switch the amplifier in and out of the circuit.

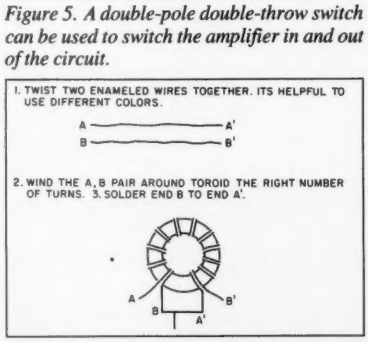

Figure 6. Bifilar winding details for T1, T2 and T3.

Table 1. Output filter values for other bands.

Band (meters)	C1,C3	C2	L1,L2
12	117 pF	220 pF	8 turns, T-50-6 toroid
15	138 pF	270 pF	9 turns, T-50-6 toroid
20	138 pF	420 pF	12 turns, T-50-6 toroid
30	289 pF	579 pF	12 turns, T-50-2 toroid
40	400 pF	800 pF	14 turns, T-50-2 toroid
80	700 pF	1415 pF	19 turns, T-50-2 toroid

Note: use #26 wire for C1 and C2. Use capacitors that are closest to these suggested values. As the operating frequency decreases, the gain will increase as well as the possibility for instability. You may have to use RC feedback to negate this effect. Values for the above table were obtained from the QRP Notebook by Doug DeMaw.

trimmers in the completed transmitter to achieve a good balance in the system as a whole. Listen to your voice in the station receiver and you will be rewarded with a cleaner signal.

On-the-air tests were gratifying. While true QRP operation is a lot of fun, a little punch in your signal will enhance its readability and produce longer and more enjoyable contacts. I found that contacts with armchair copy were easy to make. Of course, it's always the best policy to use less power when it will suffice, but no one will suggest you are using overpower on the ham bands at 10 watts! Happy home-brew DXing! 73

Table 2. Parts List

Part	Description
U1	LM317 variable voltage regulator
Q1	2SC1969 power transistor
RFC1	10 turns on an FT-37-43 toroid
T1,T2,T3	10 turns #26 wire, bifilar wound on an FT-50-43 toroid (an FT-37-43 can be used for T1 & T2)
D1	1N4001 rectifier diode or equiv.
L1,L2	8 turns #26 wire on a T-50-6 toroid
C1,C2,C4,C5,C7	0.1µF/50V ceramic capacitor
C3,C6	47µF/16V electrolytic capacitor
C8,C10	100 pF ceramic capacitor
C9	200 pF ceramic capacitor
R1	15 ohm resistor
R2	27 ohm resistor
R3	330 ohm resistor
R4	5k PC mount potentiometer

An etched PC board is available for $6 + $1.50 shipping per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

Toroids and other components can be obtained from Tanner Electronics, 1301 West Beltline Rd., Suite 105, Carrollton TX 75006. Tel. (214) 242-8702. Radiokit, P.O. Box 973, Pelham NH 03076. Tel. (603) 635-2235. Circuit Specialists, P.O. Box 3047, Scottsdale AZ 85271-3047. Tel. (800) 528-1417 and RF Parts, 1320 Grand Avenue, San Marcos CA 92069. Tel. (619) 744-0700.

Michael Bryce WB8VGE
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The 4066 IC

Several months ago, I mentioned using a 4066 IC for audio muting in the HW-9. This IC was put to good use by Paul Levesque KB1MJ. It occurred to me that many people who design their own gear might not know about this very versatile chip.

So, just what is a 4066, anyway? Well, it's a quad analog switch. Basically, it's just four CMOS switches that can be turned on or off by putting a voltage on a control line. With zero volts on this line, the switch is open. Apply more than half the supply voltage on the control line, and the switch turns on. The "on" resistance is anywhere from 80 to 270 ohms.

The 4066 can pass DC for switching, RIT circuits, and, of course, relays. The 4066 can also pass audio with low distortion, and handles RF up to 40 MHz. You can switch it on and off up to 10 MHz. The low current demands make this a QRP potable rig-builder's dream come true—only 0.5 microamps. The peak switching voltage must not be higher than the supply voltage, however. There are current limits flowing through the switches.

Since there are four switches in one 4066, any leftover switches can be used to control other circuits instead of transistor switches. Relay drivers and LEDs come to mind. If you don't need them for this, you can wire up the leftover switches in parallel for more current capacity. You might want to do this if you use a T/R relay with a coil resistance under 300 ohms.

The 4066 IC might be the chip you're looking for if you're into QSK transceivers. A pair of small reed relays could do all the RF switching, with the 4066 doing the DC and audio switching.

Because the 4066 is a CMOS device, it is easily damaged by static unless buffered. Most of the CMOS chips made today are buffered, but beware of the surplus ICs, and, of course, ICs from old computer boards. Keep static away from the chip, and you'll have no trouble. Also, with any CMOS chip, all unused inputs should be tied to either ground or Vcc. Don't let them float!

The 4066 can be purchased for about 60¢. Radio Shack stocks the 4066 at a slightly higher price. See Figure 1 for various uses of the 4066.

Argosy Break-In Delay Mods

In the past, I've had modifications for the Heath QRP rigs. Now I've got several this month for the Ten-Tec Argosy.

Anyone who has used the Argosy knows that there is no RF gain control. But don't get ahead of me—this isn't a modification to add either an RF gain control or RF attenuator. Instead, this modification slows down the QSK during periods of high QRM or QRN. It would be especially helpful during a CW contest. The "thumping" in the headphones is greatly reduced with this modification (see Figure 2).

The modification gives three types of break-in delay: A slightly extended break-in to reduce the "thumping"; normal, full break-in; or the semi-break-in delay, as used on the Corsair.

The break-in delay is determined by C40 in the AF-IF board. This is a 1 µF electrolytic capacitor. Also on this board is plug 36, which has a spare unused pin.

To carry out the modification, first cut the PC trace between the two pins of plug 36. Solder a 1k ohm resistor from the positive end of C40 to the unused pin on plug 36. This resistor should be on the underside of the board.

Drill a 1/4" hole on the rear panel next to the HI/LO power switch. A small toggle switch of the ON-OFF-ON type is required. Wire this switch as shown in Figure 2. A large solder lug around the switch's shaft will make a convenient place to ground the required resistors. By selecting the value of the capacitor, you change the delay break-in time constant.

A word of caution. If you don't know what you're doing, don't attempt this modification. Anytime you have to cut traces, be sure to measure twice, cut once! I have not done this modification to my Argosy, so do so at your own risk.

To reduce the amount of RIT offset in the Argosy, here's a simple mod that requires only one additional part—a resistor.

Wire a 15k resistor across the RIT control. This will reduce the offset to about +2.9 kHz to −3.1 kHz. This is a great way to fine tune the RIT; makes it so much easier to tune in a signal when using the narrow crystal filters.

Next month we'll visit the shack of a DXer and QRPer, all rolled into one. The Pulse Charger was such a success that I have made up more kits of the PC board and parts. It's still $29.95 plus $2.50 for postage. It would be a great project for the coming winter months. 73

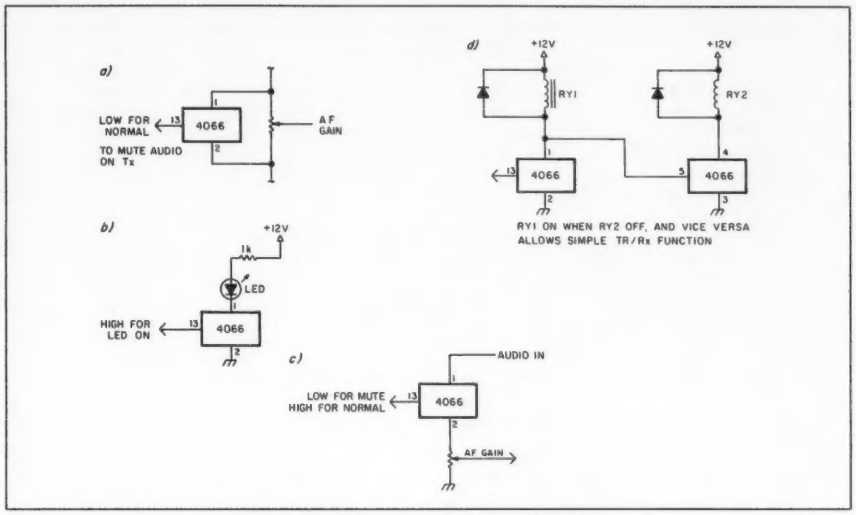


Figure 1. The 4066 IC can be used in a number of ways.

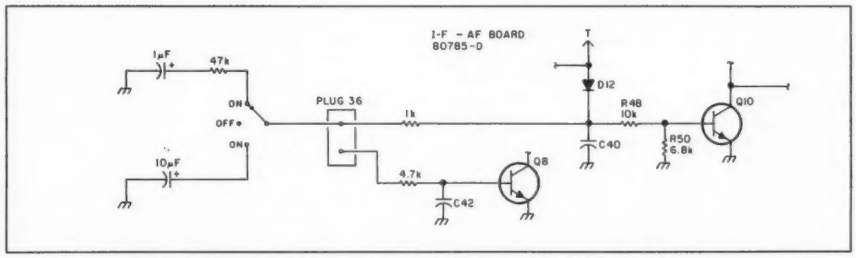


Figure 2. The break-in delay for the Argosy is determined by C40 in the AF-IF board.

ATV

Ham Television

Bill Brown WB8ELK
℅73 Magazine
Forest Road
Hancock NH 03449

The Amateur Television Network

What do you do if you are surrounded by 5000-foot (or higher) mountains? You plant ATV repeaters on top of them, of course! In Southern California you're never out of reach of at least one of the many machines that cover the region. Over the past few years a group called ATN (the Amateur Television Network) has been undertaking an ambitious effort to link some of these repeaters together to form a wide-area system.

The first repeater in the network is the WA6SVT machine with an input on 434 MHz (426.25 alternate) and an output on 1253.25 MHz. It is located on top of 5670-foot Santiago Peak. Its location, southeast of Los Angeles, covers most of the Los Angeles basin and the San Bernadino/Riverside valleys, most of the San Gabriel valley, as well as a good deal of San Diego county.

Linking it All Together

Mike K6ZSR and Mark NU6X started a repeater project to fill in coverage in the San Fernando Valley and parts of Ventura County. With an output on 919.25 MHz, it was the first repeater (of any kind) to use the new 900 MHz band. It's located on top of Oat Mountain, near Chatsworth. The Oat machine was the first to be linked up to Santiago Peak (although it's currently a one-way link from Santiago). The Oat machine operates as a normal ATV repeater if someone is transmitting on its 434 MHz input. If the Oat repeater is idle and the Santiago repeater is up and running, a 1253.25 MHz receiver at the Oat Mountain site links this to Oat's output on 919.25 MHz. That way anyone in the San Fernando Valley can watch what is going on in the rest of the ATN system.

The third repeater in the network is the WB6VVV/WA6SVT machine on Job's Peak (near Crestline) high above San Bernadino. This machine uses the same 919.25 MHz output as the Oat repeater. A number of mountains (as well as a fair distance) separate the two machines, so there is no interference problem. This machine is a key factor to linking into the Mojave Desert and beyond. Not only can it be linked to the Santiago Peak machine (in the same manner as the Oat repeater), but an ambitious project has been undertaken to use this machine to link all the way into Las Vegas, Nevada!

The Las Vegas Connection

Geoff KB7BY (along with encouragement and help from Mike WA6SVT and area ATVers) installed the Las Vegas ATV repeater at the 8500-foot level of Mt. Potosi (just west of Las Vegas). The output is on 1253.25 MHz with a primary input on 434 MHz (AM-TV) and an alternate input on 913.25 MHz (FM-TV).

From his mountaintop home at Crestline, California, Mike WA6SVT could access the Mt. Potosi machine quite regularly, even though it was 200 miles away! Linking Las Vegas with the Los Angeles area looked like a possibility. Since a direct hop was quite weak most of the time, an intermediate relay site was needed.

Rodman Mountain turned out to be the ideal site for the relay. Even through it's located 48 miles from the WB6VVV machine at Crestline, and over 110 miles from KB7BY/r at Mt. Potosi, the reception at Rodman was good from both repeaters.

The Rodman Relay

The Rodman relay site is rather unique. With two receivers and two transmitters, it operates as a full-duplex dual-direction link. To relay video from Mt. Potosi down to California, the Rodman site has a 1253.25 MHz receiver which constantly monitors the output of the KB7BY repeater. This is relayed back to Job's Peak machine via a directional 1289.25 MHz FM-TV transmission.

To send video back to Mt. Potosi from the Job's Peak repeater in California, the Rodman site monitors a 33cm link and relays it to Mt. Potosi via another 1289.25 MHz FM-TV transmitter. To receive the Rodman relay, FM ATV receivers are located at both Job's Peak and Mt. Potosi.

Since the Rodman transmit antennas are pointed in different directions, the capture effect of FM-TV allows the use of the same frequency (1289.25 MHz) in both directions!

Priorities and Control

OK, sounds good, but how do you activate the link?
You don't; it operates automatically. The link video is always available at the repeaters on each end of the path. All the repeater controllers at Mt. Potosi and Job's Peak do is choose which video signal to repeat.

This is done with a custom repeater controller that is installed in each ATN repeater. Here's how it works: The controller monitors up to eight sources of video. These can be from the demodulated output of different input frequencies, the Rodman link, a video ID, or even a local feed (such a satellite dish tuned to NASA Select). The controller prioritizes each video input port. If just one video source is active, then it gets repeated out. If two or more signals are active at the same time, the controller sends out the video with the highest priority.

For example, you can set up 434 MHz as your primary input, 913.25 MHz as the secondary, the link next, and finally a computer video ID. As soon as any local activity stops, anything coming in from the link receiver comes on line. When all activity stops, your repeater ID comes up. You can even set it up so that a control operator can redefine the priorities via a remote command. This would be useful if you want the link to be the primary signal for special nets.

Most ATN repeaters have another interesting feature. Whenever something comes in on a link frequency while local stations are using their repeater, the link signal is inserted into the local picture as a "picture-in-picture". Although this feature can be turned off, you never have to miss what's going on in the rest of the system.

The current system has the potential to allow ATVers over 400 miles apart to work each other. For those of you who live in the flatlands, this is definitely what you would call a significant band opening!

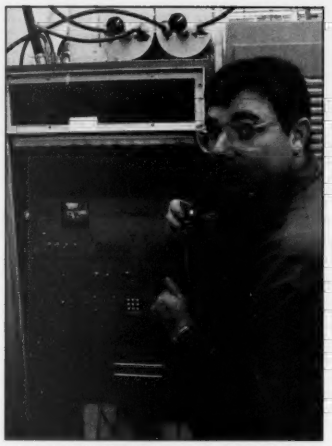


Photo B. Bill KB6MCU tests the WA6SVT ATV repeater on top of 5670-foot Santiago Peak.

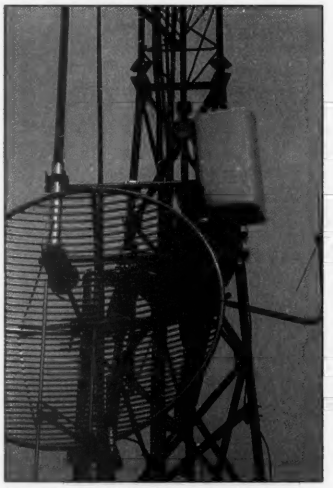


Photo C. Geoff KB7BY adjusts the 23cm antenna which helps link the Mt. Potosi, Nevada ATV repeater into Los Angeles.

Linking up the Southwest

Future links are being planned as more and more mountaintop ATV repeaters sprout up across the Southwestern U.S. Some of you may be familiar with the linked systems of voice repeaters such as the ZIA connection, Cactus and the Condor system. Using a combination of these systems, I've been able to talk from El Paso, Texas to Santa Barbara, California (over a thousand-mile distance) from my 2m mobile rig to a friend on the beach on his HT! Believe me, it's quite fun to hear dozens of quick kerchunks as the stacked up repeaters drop out.

Using a series of 900 MHz, 1.2 and 2.4 GHz FM-TV links, a number of ATN machines will be linked up in the near future (see the figure for a map of all known ATV repeaters in the Southern California region). Work is currently underway to link from Los Angeles up to the N6VLV/WA6SVT repeater in the Tehachapi range east of Bakersfield.

There may even be a future link on up to the WA6YLB Blue Ridge repeater

Photo A. Some of the members of the Amateur Television Network (ATN).

east of Fresno. Just one more hop could take them all the way up to Sacramento and the San Francisco Bay area. To the west, Rod WB9KMO will be linking in from his Gibraltar Peak machine (as well as the K6TZ Santa Cruz Island link) above Santa Barbara.

To cover the area north of the San Fernando Valley, Dave WA6ZVE plans to link with ATN from his Loop Canyon machine. And to complete coverage in the Mojave Desert, Mark WB7AJC has his machine on top of 8400' Frost Peak near Wrightwood. Also in the future, there is interest from ATVers in Phoenix, Arizona (the AAA5 group), and some in Utah, in linking into the ATN system via Mt. Potosi.

ATN Activities

Lest you think that this might be too much for the ATN group, they are very experienced at bouncing video around via multiple links and repeaters. For many years, they've covered the annual Tournament of Roses Parade in Pasadena. Some of you may have seen the massive effort they put on during the 100th anniversary of the parade. They had 17 portable transmit sites along the parade route (14 fixed and 2 motorcycle mobiles, as well as W6ORG in his helicopter).

All the sites were linked back to mission control from a rooftop repeater, along with two separate 10 GHz links to tournament control and the public safety center. Not only that, thanks to Dave WA6ZVE, they linked it all up to a commercial satellite so that the whole country could watch the fun (they even arranged an intro about amateur TV by Michael Landon). Other activities that have been covered by the group include the L.A. Marathon, the Angeles Crest 100 race, and several boat races.

To aid in disaster assessment, they have installed ATV antennas in several of the sheriff's department helicopters. In addition, a number of EOC centers have ATV receivers which are tuned into the ATN network. In the event of an emergency, ATN members (in support of RACES) can transmit video from the helicopters which can be viewed at the emegency control centers.

There's plenty to watch on the ATV repeaters in Southern California. They even occassionally link a remote observatory so that astronomy buffs in the greater L.A. region can watch the heavens from clear skies.

You Haven't Seen Anything Yet

If you're in the L.A. area or just visiting, give the locals a listen on their calling frequency of 146.43 MHz. The weekly ATN net meets every Tuesday evening at 8 p.m. They have 2 meter remote bases at each ATV repeater site which allows check-ins from a wide area. This includes ATVers in the Las Vegas area who can not only watch the action, but check in on voice as well using the Rodman link.

If you'd like to find out more about ATN, and help out with future link possibilities, you can contact them at the following address: ATN c/o Mike Collis WA6SVT, P.O. Box 1594, Crestline CA 92325.

More Machines

There are a number of ATV repeaters which are not connected into the system. The K6KMN repeater (434 in/1241.25 out) sits on top of Mt. Wilson above Pasadena. From its vantage point with wide coverage of the L.A. region, this is a good place to look during shuttle missions for live video from NASA. Listen for the Mt. Wilson net on 146.43 every Monday night at 8 p.m.

The Sulphur Mountain group has the WA6UCL (1253.25 out) repeater, which covers Simi Valley and the Ventura area. They have a net every Tuesday night on the 146.88 repeater at 8:30 p.m. In the San Diego area, watch for the WA6VLF repeater (1277.25 out) on top of San Miguel mountain. For those of you north of Santa Barbara, look for the Buellton repeater (K3NXF) in the Santa Ynez valley.

As more and more repeaters spring up across the Southwest, it won't be too long before an ATVer in El Paso or Salt Lake City can link up to watch the sunset over Catalina Island! 73

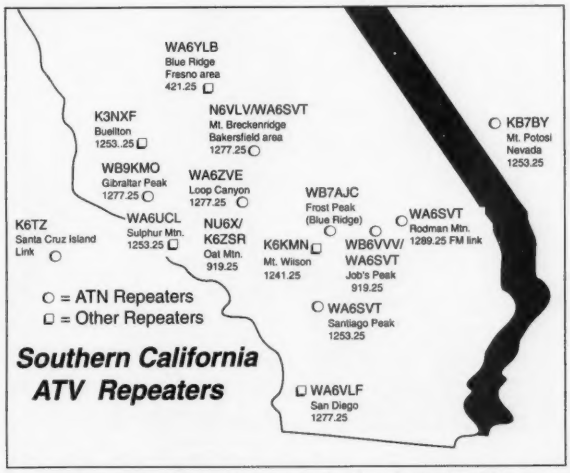


Figure. ATV repeater locations in the Southern California region.

HOMING IN

Radio Direction Finding

Joe Moell, P.E., K0OV
P.O. Box 2508
Fullerton CA 92633

RDF Potpourri

More and more ham clubs are discovering the fun of hidden transmitter hunts, often called "foxhunts" or "T-hunts." To get your group started, all you need is someone to hide the transmitter, and some sort of audio/control unit for the transmitter. Last month's "Homing In" column featured construction plans for TBOX, an easy-to-build tone/ID generator and on/off cycler for hidden T's.

As I indicated last time, TBOX inventor Ron Seese N6MBR has a PC board available. The board layout includes some optional "bells and whistles" that were not part of last month's simple 6-IC project.

By adding a Dallas Semiconductor DS1216C SmartWatch RAM socket and a few other parts to the board, you can program TBOX to start transmitting at any selected day and time. That's perfect for advanced hunts with multiple transmitters.

If you are not going to stay close to your hidden T, you need a way to turn it off remotely, to satisfy FCC 97.109. Ron's board has provisions for an SSI-202 DTMF decoder IC to control it via a link receiver above 222 MHz (FCC 97.201(b)). A 144/222 or 144/440 MHz dual-band rig is perfect for a remotely-controlled 2 meter fox with TBOX.

TBOX's user-friendly firmware is easy to use (Photo A). Ron continues to develop new versions to incorporate these optional features. To find out what's available, send an SASE to him at 6136 Landino Drive, Westlake Village CA 91362.

TBOX Construction Hints

You can use non-CMOS parts at U1 and U2, but power drain will increase significantly and regulator U7 will run much warmer. Bolt a heat sink to U7 if you use non-CMOS parts, or if your TBOX must operate in a hot location.

Dallas Semiconductor's DS1228 RS-232 interface IC is a direct replacement for the Maxim MAX232 at U6. Advanced Computer Products has the DS1228 and all other ICs except U5, plus the crystal. ACP is located at 1310 East Edinger Avenue, Santa Ana CA 92705; telephone (800) 366-3227. U5 is available from N6MBR.

Most mobile and hand-held rigs on the market today require less than one milliamperes to key the PTT circuit. Older transmitters such as the TS-700A use relays that draw more current than Q1 and U1 can supply. If in doubt, use a multimeter to measure the current in your rig's PTT line when you key down.

If PTT current is more than 10 mA, add a reed relay, such as Radio Shack 275-233. Connect the coil between +12V and the collector of Q1. Connect the relay contacts to your rig's PTT circuit. To protect Q1 from voltage spikes from the relay coil, put a 1N4001 diode (RS 276-1101) across the coil. Cathode of the diode goes to the +12V side.

T-Hunting in the Desert

Hams in Phoenix know how to promote their hobby. For example, everyone there knows about the thousands of phone patches that were put through K7UGA's super-station over the years by dozens of dedicated volunteers.

Now another voice is bringing ham radio to the citizens of that area. Len Winkler KB7LPW (Photo B) hosts "Ham Radio and More," a one-hour program devoted to all aspects of our hobby. It airs weekly on KFNN, a 10 kilowatt radio station at 1510 on the AM dial, covering much of central Arizona.

Some talk radio jocks have it easy. They gab for two minutes and then play five minutes of commercials and traffic reports. (Seems like it, anyway.) Not Len. When he opens his mike at 2 p.m. each Sunday, it stays open for the full hour. Sure, there are a few commercials (very few), but they are personally voiced by Len, live.

Len knows that most of his listeners aren't hams—yet. So he doesn't spend his hour wailing about insider topics like spectrum preservation and packet business message citations. Instead, he seeks out guests who can excite his listeners by telling about the many fascinating aspects of life as a ham.

I had the privilege of being on Len's show recently. It was easy to talk with him about competitive radio direction finding because he had already been T-hunting with John Moore NJ7E. John joined us on the air to offer a challenge from Arizona RDFers to the T-hunters of Southern California.

John wanted to see how my Southern California friends and I would fare on an Arizona-style hunt during the October ARRL convention in Scottsdale. The two areas have very different philosophies about T-hunting.

So-Cal hunters love long drives and they don't mind very weak signals. Almost everyone uses a rotatable beam or quad, and many have GaAsFET preamp SSB detectors to make the most of fractional microwatt signals that could be very far away or very well concealed. The T is often 200 miles or more from the start point on day-long or all-weekend hunts.

On the other hand, Arizona hunters value speed and strategy. Though all kinds of RDF gear are seen, Doppler sets with four or eight whip antennas are most common. Fox signals are strong and distances are moderate. Hunters try to drive to the fox as quickly as possible so the post-hunt social activities can begin.

It looks like some interesting interstate competition could be coming up. Stay tuned for more.

First So-Cal R-Hunt

Suppose your club wants to try foxhunting, but only one member has any direction finding equipment. How do you put on an event to demonstrate RDF and make it possible for anyone with a mobile rig to participate? The answer: A hidden receiver hunt.

As Robin Rumbolt WA4TEM described it in *73 Amateur Radio Today* (July 1990, page 12), the fox in a hidden receiver hunt is the only one who has an RDF set. He or she listens to transmissions from the hunters and gives them bearings relative to the hidden location. Hunters add or subtract 180 degrees to or from the true fox-to-hunter bearing to get a hunter-to-fox bearing, which they plot and follow.

Photo A. TBOX parameters can be changed in the field with a laptop computer operating in the "dumb terminal" mode. The firmware is menu-driven.

The Los Angeles Disaster Communications Service held an R-hunt on 27 July as a way of introducing DCS members to the fun and usefulness of RDF. The boundaries encompassed 420 square miles of central Los Angeles county.

The hunt took place on the 145.30 MHz RACES repeater. Dennis Soja KB6NJF and Dean Coulter N0CGW hid their receiver/quad RDF setup on the famous Mulholland Drive north of Hollywood. Some the bearings were inaccurate because of the intervening hills, but eventually all the competitors found them.

The first R-hunt was successful in attracting hams who had never tried RDF because they lacked the gear for it. I'm sure we'll soon see these folks on some of the 15 regular monthly Southern California T-hunts.

T-Hunters Aid FCC Bust

Just in from the city by the bay: Ham RDFers have helped the FCC nab an Advanced Class ham who allegedly had been using a modified dual-band transceiver to cross-link up to 18 law enforcement agencies. Public service dispatchers found themselves talking to units in other jurisdictions during the cross-linking. The suspect is also accused of jamming ham repeaters and cross-linking ham transmissions onto public safety frequencies.

Formal charges have not been filed as of this writing, so the assisting hams aren't talking about how they aided the FCC. All we know is that the suspect was apprehended while mobile along Highway 101 on the peninsula south of San Francisco. As this case is resolved, I hope the T-hunters will be able to share the story of their success with us.

R.I.P. PELTS

At deadline time, the FCC announced the termination of PR Docket 89-599, thus abandoning plans for a Personal Emergency Locator Transmitter System. What does this mean to hams and others interested in RDF for search and rescue? Will there soon be a crackdown on the illegal use of aircraft Emergency Locator Transmitters as personal rescue beacons? Or might this unorthodox ELT use become legalized?

RDF for wilderness safety is a topic that always generates a lot of reader interest. Look for an analysis of the current situation in an upcoming "Homing In" column. Meanwhile, I welcome your comments on the subject, or on any other RDF topic. 73

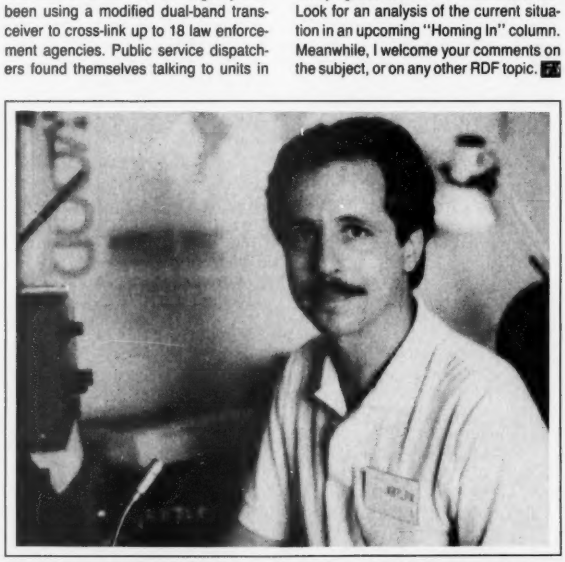


Photo B. Len Winkler KB7LPW regaled listeners with T-hunt talk on his "Ham Radio and More" show recently.

Voice ID *Continued from page 12*

your signal is distorted, you'll have to adjust R11 to reduce the audio signal to the proper level. This is typically about 20 millivolts or so.

Repeater/Beacon/Foxhunt Voice ID

You can use the voice ID for a repeater identifier. Just hook a logic signal from a repeater controller or a timer circuit in place of switches S1 and S2. Whenever the incoming logic signal goes low, one of the messages will be played.

This would also make an excellent hidden transmitter identifier for foxhunting. Just record a tantalizing message like, "Catch me if you can!" and watch the fun and frustration as your friends try to locate the transmitter. You could even program in two messages and have them alternate. If you short out either switch S1 or S2, the voice ID circuit will play back in a continuous loop through the whole 16 seconds (if you close S1), or eight seconds (if you short out S2).

If you add the dimension of voice to a beacon transmitter, you can take advantage of the digital control power of the ISD1016 chip and sequence through multiple messages. I plan to use one in upcoming helium balloon experiments where I send up 2m FM transmitters to 100,000 feet. With a few additions to the basic voice ID circuit, the sky is definitely the limit! 73

You may contact Bill Brown c/o 73 Amateur Radio Today.

Parts List.

Semiconductors	
U2	ISD1016 (or ISD1020 or ISD1012)
U1	TLC555 timer (RS# 276-1718)
U3	7805 regulator
Q1	2N3906 PNP (or 2N4403 or 2N2907)
Q2	2N3904 NPN
D1,D2	1N914 diode (optional)
D3	1N4001 (or similar) diode
Resistors	
R13	10 ohm
R9	2.2k
R4,R12	4.7k
R1,R2,R5,R6, R10,R11,R14	10k
R7	180k (or 220k)
R8	470k
R3	1 megohm
R11,R12	10k pot. (RS# 271-282)
Capacitors	
C1,C3,C4,C6,C7	0.1 µF
C2,C11,C12	10µF/16V tantalum
C10	1.0 µF non-polarized (RS# 272-996)
C14	1.0 µF/35V tantalum
C5	4.7µF tantalum
C8,C13	22µF/16V tantalum
C9	0.22 µF
Miscellaneous	
Mike	Electret Microphone (PC-mount) (RS# 270-090)
S1,S2	Momentary-contact push-button (RS# 275-1571)
S3	DPDT toggle switch (RS# 275-626)
S4,S5	SPST toggle switch (RS# 275-624)

PC board (see below); Speaker—2" speaker; Box—Radio Shack project box; battery; battery clip or holder

An etched and drilled printed circuit board is available for $4.60 + $1.50 per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

The ISD 1016 audio storage IC is available for $55 + $3 shipping directly from ISD, 2841 Junction Ave., Suite 204., San Jose CA 95134. For more information, call (408) 428-1400 or (800) 825-4473.

A complete kit of parts including the PC board and the ISD 1016 is available for $99 from ELKTRONICS, 12536 TR77, Findlay OH 45840. Tel. (419) 422-8206.

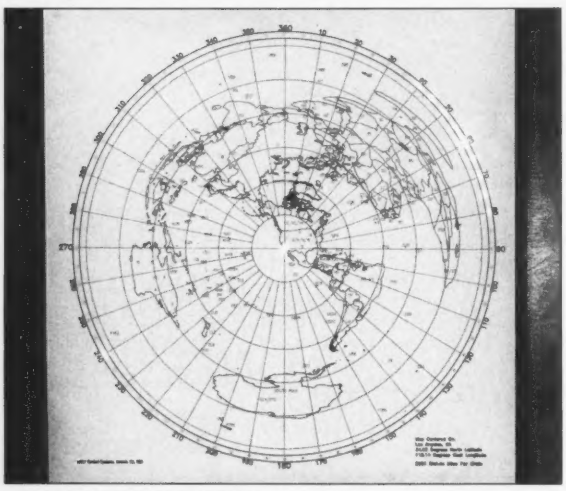
NEW PRODUCTS

Compiled by Hope Currier

ICOM

Icom has introduced the IC-2SRA 144 MHz and IC-4SRA 440 MHz hand-held transceivers, with a wideband receiver installed directly into the unit. These compact HTs (13.6 ounces; 2.1″ x 5.3″ x 1.4″) will receive everything from 25 to 905 MHz. If you connect an external 13.5 volt power supply, these handhelds will provide a full 5 watts of output power. Independent squelch and volume controls allow you to change settings in each band separately. Icom's frequency monitoring system lets you monitor memory channels, the complete frequency band, specific parts of the band and priority channels. There is a built-in pager and code squelch unit. The IC-2SRA and 4SRA also have 96 memory channels, a 24-hour clock, four DTMF memory channels, and a variety of tuning steps.

The suggested retail price for each model is $599. For more information, contact *Icom America, Inc., 2380 116th Ave. N.E., Bellevue WA 98004; (206) 454–8155, FAX: (206) 454–1509.* Or circle Reader Service Number 201.



VECTOR CONTROL SYSTEMS

Vector Control Systems has released a new 16″ x 16″ x 1″ electronic beam indicator. Using a four-color custom-plotted great circle map (centered on your QTH), the indicator shows your antenna's direction and coverage with a 5 degree resolution. A simple connection to any standard rotator control unit makes the beam indicator operational. The adjustable beam width indication is a special feature which allows you to match it to your beam's radiation pattern.

The indicator is available in a glass-covered black or silver frame. It's priced at $179.95, plus $8 S & H. Contact *Vector Control Systems, 1655 North Mountain Ave., Suite 104-45, Upland CA 91786; (714) 985–6250.* Or circle Reader Service No. 204.

WINTER DESIGN

Winter Design is offering a unique gift for the office or home for engineers, technicians, hams or computer fans: a clock made from an actual etched printed circuit board. This battery-operated clock is 17″ x 17″, and comes in two color combinations: blue board/silver etch/silver frame/white silk screen hands and numbers; or green board/silver etch/silver frame/white silk screen hands and numbers. The price is $49.95, plus $5 S & H. Contact *Winter Design, 267 Court Rd., Winthrop MA 02152; (617) 846–5745.* Or circle Reader Service no. 207.

TRIPP LITE

The new Tripp Lite PR-Series DC power supplies are housed in a compact, dark metal cabinet that blends in with modern communications and amateur radio equipment, giving an integrated, professional appearance to any radio or electronics installation. The PR-Series gives exceptional performance for base or mobile radios, test equipment and other electronic gear. Its continuous-duty performance stands up to extended periods of operation for reliable operation under all circumstances. These DC power supplies offer crowbar protection, excellent IC voltage regulation, automatic overcurrent protection and full-line isolation, providing clean, stable DC power for your equipment.

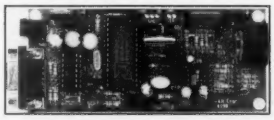
The PR-Series DC power supplies are available in 3 to 60 amp sizes, with suggested retail prices starting at $32. For more information, contact *Tripp Lite, 500 N. Orleans, Chicago IL 60610-4188; (312) 329–1777, FAX: (312) 644–6505.* Or circle Reader Service No. 203.

CONNECT SYSTEMS

Connect Systems is now offering a new low cost full duplex interconnect, the Model CS-800, which can be user-programmed to operate either full or half duplex. The Model CS-800 features a built-in repeater maker, a nine-number memory speed dialer, last number redial, a built-in user programming keyboard and digital display readout, user-programmable Morse ID, hookflash, ringout (sounds like a phone ringing), line-in-use detect/call waiting, regenerated tone or pulse dialout, programmable toll restrict, programmable connect/disconnect and secret toll override codes, programmable activity/timeout timers, non-volatile memory, and lightning protection.

The suggested retail price for Model CS-800 is $349. Contact *Connect Systems Inc., 2064 Eastman Ave., Suite 113, Ventura CA 93003; (805) 642–7184, FAX: (805) 642–7271.*. Or circle Reader Service No. 202.

A & A ENGINEERING



BayCom from A & A Engineering is a software-based packet system for PC/clones that does not require an expensive TNC. The modem plugs directly into a standard 9-pin serial port, or a 25-pin port with an optional cable adapter. A 45-second watchdog timer and reed relay PTT are standard. A small wall-power supply and a software disk are included with each kit or assembly.

No alignment is required for either HF or VHF operation. A single three-position mode switch allows HF, VHF normal or VHF with equalizer operation. The modem circuit provides improved HF receive operation.

The price for a blank board, #190-PCB, is $12.95; a complete kit, #190-KIT, is $59.95; an assembled and tested board, #190-ASY, is $89.95. U.S. Shipping is $5. California residents add 7.75% sales tax. Contact *A & A Engineering, 2521 W. LaPalma #K, Anaheim CA 92801; (714) 952–2114, FAX: (714) 952–3280.* Or circle Reader Service No. 205.

CW ENTHUSIASTS

CW Enthusiasts has released PC Super Keyer 2.1. This software for IBM compatibles provides all of the features of expensive memory and keypad keyers in an economical and easy-to-use package. It features paddle or keyboard input, disk storage space for eight unlimited-length messages, transmission of any text file, beacon operation, message within message, on-screen display of paddle input and local/UTC clocks. In addition to functioning as a keyer, PC Super Keyer will send random five-letter code groups of random or U.S. callsigns for code receive practice. The on-screen translation and display of paddle input can also be used to practice sending with a paddle.

The PC Super Keyer is priced at $24.95 for software and complete documentation, $39.95 with an interface parts kit, and $49.95 with the assembled and tested interface, plus $3 S & H. It is available on 5.25″ and 3.5″ disks. Contact *CW Enthusiasts, 1346 Erickson, Suite R, Columbus OH 43227–2061.* Or circle Reader Service No. 206.

ATTENTION REPEATER OWNERS—DELTATONE™ 2.0
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DELTATONE™ 2.0, the perfect complement to your repeater controller investment. DELTATONE and your MS-DOS computer offer unlimited 16-digit tone generation for local or remote programming of your repeater controller. DELTATONE accepts programming commands from a file created using your favorite word processor. Commands and comments can be freely mixed within the file. DELTATONE's intelligent device driver conveniently sends only the commands to the DELTATONE interface via your printer port.

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- DTMFTONE.SYS Intelligent device driver uses less than 2K system memory
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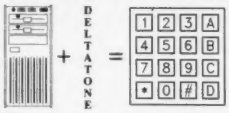

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- Features:
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  - All modes selected by push buttons or computer commands
  - Open Squelch DCD feature on conventional AFSK
  - PacComm's popular personal Message System included
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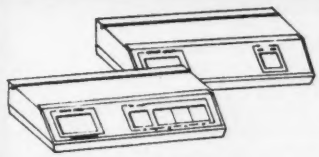

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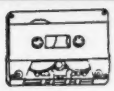

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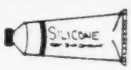

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Holiday Gifts

The holidays they are a'coming! Next month begins with Chanukah, then Christmas and Kwansa. Whatever your orientation, it seems appropriate to look into gift giving this month. Let me take this opportunity to highlight items of interest to digitally-inclined amateurs.

No doubt about it, gift giving can get expensive. With amateur radio, it can get *very* expensive! But not all of us are independently wealthy, and often the pleasure inherent in a gift has nothing to do with its cost. To that end, I shall try to break down my suggestions into categories, by cost. To use this column effectively, either circle or highlight items of interest to you, or place a sticky note with an arrow on the page, leaving the magazine open on the kitchen table. A flashing red light or rotating beacon might be a bit too much, though.

Very Low Cost or Essentially Free

A piece of newsprint in a frame graces one wall of my shack. Crayoned thereon is my toddler's impression of daddy on the radio. Cost? Nil. Meaning? Unmeasurable!

Is someone in the family handy with needle and thread? How about a dust cover for the equipment, as opposed to the commercial plastic jobs? A cushion for the operating chair might be nice as well.

You get the idea? Handcrafts of any sort can be applied to the ham/computer shack in an endless variety of forms. From a ceramic holder for this or that, to a custom-made hat (bought cheaply at the variety store and hand-decorated), it doesn't have to cost a lot to be meaningful.

Under Ten Bucks

For the RTTYer who is using a mechanical teleprinter, a trip to the office supply store will turn up many useful items, which are quite affordable on a harmonic's budget. Standard Underwood typewriter ribbons fit Model 15/19 teleprinters. Various types of cleaning putty and paper products are also available to keep the print sharp and readable. A tube of Lithium grease from the hardware store can also help with machine maintenance.

Other items useful in the ham shack include a supply of solder, test clips, connectors, or other small items of use to home-brewers. Is there a local amateur supply store in your area? See if they will provide a gift certificate, to allow the ham to select his or her own goodies.

Computer-oriented hams seem to always be able to use floppy disks (be sure to get the right size) and paper for the printer. There are a variety of novelty items, ranging from special pens with which to label disks, to boxes to put those disks in, all quite nominal in price.

Software is always in fashion, as well. For the best value for the dollar, it is hard to beat the collection offered by this column. PC compatible users can obtain the latest TRTY (teletype) program, on disk, for a self-addressed stamped disk mailer and $2.00. I have been known to fill space on high density (1.2 and 1.44 Mb) disks with extra programs, as well. Send requests to the above address.

Commercial sources include Aero Data Systems, a *73* advertiser who offers a wide variety of programs for PC clones, Amiga, and C-64 systems. Priced at $4.50 per disk, this is a good way to obtain some fine public domain and shareware offerings.

Reasonably Priced

I know, what's "reasonable"? My intent here is to look at stuff which is under a hundred dollars, and which represents good value for the dollar. So, while price is not the only objective, I will use it as a yardstick.

How about a good book? Our dear old Uncle Wayne has a Bookshelf just loaded with sources you will want. Here's a partial list.

- 07R25, *The RTTY Listener*: Up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. $19.95
- 03S208, *Radioteletype Press Broadcasts*: Press service schedules in English, French, German, Spanish and Portuguese. $12.95
- 03R01, *World Press Services Frequencies (RTTY)*: 5th edition manual with all information, plus coverage of 65 World Press Services broadcasting in English. $8.95
- 03R02, *RTTY Today*: Covers all facets of RTTY, fully illustrated. $8.50
- 01P22, *The Packet Radio Handbook*: The definitive guide to amateur packet operation. $14.50

Users of the AEA line of multimode controllers often express a desire for more powerful controller software. PktGOLD is advertised as one such program. It should greatly expand the capabilities of the PK-232 and PK-88 controllers. The program is available for $59.95 plus $5 shipping and handling from InterFlex Systems Design Corporation.

Do you have a CD-ROM drive on your computer? Buckmaster Publishing has the HamCall CD-ROM, which has listings on 500,000 amateurs, plus "1000's of public domain amateur radio programs and data." The disk itself is only $50, cheaper than a stack of *Callbooks*! Contact Buckmaster for full details.

More Than A C Note

Now, there will be situations and circumstances where someone might be willing to spend some real money on you. Other than the obvious items, a new computer, printer, or radio gear, let's take a look at some specific material of particular use to the RTTYer.

In most RTTY shacks, there is never enough test equipment. Frequency counters seem invaluable for a mode so locked into certain frequencies. Startek International has a 1500 MHz hand-held counter with accessories for $128, which should find a place on any amateur's bench.

We've covered WEFAX here before, so take a look at Software Systems Consulting's PC GOES/WEFAX 3.0, for $250. This is a professional FAX reception system for PC clones. Including an AM/FM demodulator, software, and tutorial, this looks like one capable system. For a bit less money, their PC HF Facsimile 5.0 is an HF FAX system, also including an FSK demodulator. This one is available for $99. They tell me that if you get PC HF FAX, you can add PC SWL for another $20. This is a demodulator, software, and manuals to get you onto listening to Morse, RTTY, and other modes on the HF spectrum. Overall, these sound like very interesting packages.

MFJ is now offering their MFJ-1278, a multimode controller that features packet, AMTOR, RTTY, ASCII, CW, FAX, SSTV, and more, with color SSTV supported with appropriate software. At $279.95 for the base unit, this one will be hard to beat! I wouldn't mind getting one of these, myself!

AEA has updated the venerable PK-232MBX with new software, reportedly making it a strong contender on the air. Their new DSP-2232 looks very good on paper, and I look forward to reviewing it as soon as information becomes available.

So, What'cha Gonna Do?

I hope I have been able to plant a seed or two that might germinate into something wonderful this holiday season. As we gather together to observe our various customs, let us reflect upon the wonder of amateur radio. This hobby of ours is unique in that it breaks down boundaries, bridges languages, and allows cultures to communicate. Through communication comes understanding. Through understanding comes friendship. Through friendship comes peace. May this be a season of peace and understanding for all of us, our families, friends, neighbors, and governments.

I look forward to hearing from you by mail, or by e-mail on CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR). As I write this, I am looking at another on-line service as well. Perhaps I'll write more on that one down the road, along with other goodies here on RTTY Loop. 73

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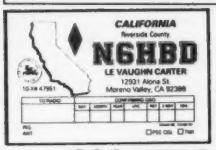

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Microwave PLL Brick Filters

The basic filter covered last month was the most inexpensive filter available—a tin can and a variable capacitor. This month I'll continue to cover filters and their applications as they pertain to microwave oscillator (brick) filters, in particular the modification for operation on the amateur band. This modification requires re-tuning the filter about 1 GHz lower in frequency.

The modification of the phase-locked oscillator's filter can involve a little bit of black magic, which I hope to unmask. It's easy to modify brick filters if you have a spectrum analyzer handy, but you can also adjust them to the desired frequency with a power meter. However, you can never be quite sure that it is providing proper harmonic output when completed.

Power and Crystal Oscillators

Surplus brick oscillators were originally constructed for the commercial common carrier frequency bands 5.9–6.8 GHz and 10.7–12.7 GHz. These frequency bricks are of prime interest to amateurs for both the 6 and 10 GHz bands. The bandwidth of the original filter varies from 300 to 500 MHz at the 3 dB points. Whatever frequency brick you select, it must be electrically and mechanically sound.

The brick oscillator has a high power oscillator operating in the 1.2–2 GHz range with about 1/4 watt power output. This oscillator is compared to a crystal in the 90 to 108 MHz range and is phase-locked by a varactor control circuit to lock the high power oscillator to a harmonic of the crystal oscillator. This harmonic number is normally the 12th in a 6 GHz brick, and uses the 17th or 18th harmonic in a 10 GHz brick.

This power oscillator is adjustable with a cavity tuning screw to obtain phase-lock in reference to the crystal oscillator. The output from the power oscillator is then coupled to a step-recovery diode frequency multiplier, and the selected harmonic is passed by the output microwave filter. This is all part of the multiplier assembly, which is the top rectangular module under the blue label, as shown in Photo A.

The filter's job on this assembly is to attenuate all unwanted harmonics. The output of the SRD multiplier is rich in harmonics. The filter can be hundreds of MHz wide and still be effective. In a 10 GHz brick, it can reject the 16th and 18th harmonic and pass the 17th harmonic. Most bricks that you find will cover a wide variation in frequency, but electrically they are the same. The big difference is where the filter is tuned, and for very high frequency operation some cavity dimensions are shorter. This makes modifying a 12.5 GHz brick a little harder than an 11.5 GHz brick.

Let's get into the modification details. I will modify a Frequency West brick. Though the principles of modification are also applicable to the California Microwave bricks, they require slightly different construction methods. Two different types of filters are used, and I will cover them both.

The Frequency West Brick

The 10 GHz Frequency West brick I converted was originally set for operation between 10.750 GHz–11.750 GHz. I re-tuned it to 10223 MHz in the 10 GHz amateur band. In a 6 GHz brick the filter is re-tuned to 5.615 GHz, assuming you are using a 145 MHz multimode radio for the variable IF. This produces 10.368 GHz and 5.760 GHz, which is the upper mix products using a 2 meter transceiver for our IF.

The Frequency West PLL brick high power oscillator is pre-set to the low end of the filter passband, as evidenced by reduced output power. Adjust the filter slightly to increase power, repeating this procedure several times until the filter frequency is within the target frequency of 10.223 GHz.

In difficult cases, with the filter mistuned and no output signal, you have a problem. Real black magic is now at hand. Go slow and do not tune the filter in large steps. Remember which element (last adjusted) caused trouble, and return it to its prior setting before adjusting another element of the filter. When out of wack, it's quite hard to set up without good test equipment.

The brick will give a swept output when operating without a crystal. It is being swept by an internal housekeeping circuit used to obtain phase-lock whenever power is turned off and on. This sweep circuit is disabled automatically when the low frequency crystal is functioning.

Modification Details

Begin the modification by removing the blue label on top of the unit, pealing it back slowly. This reveals four large screws recessed on the corners of the unit. Unscrewing the panel allows you to remove the multiplier assembly (required on some units). However, if your unit has a set of five Allen set screws held in place with lock nuts, you do not need to remove the multiplier to make the adjustments. But if your unit has only the Allen screws, you *will* need to remove the multiplier.

To unmount the multiplier, remove the four 6/32 bolts, lift the module up, and swing it around 180 degrees. After you complete the modification of the oscillator, reinstall the multiplier by reversing these directions. Then place the coupling probe back into the cavity port and hold it in place with a mounting screw, clamp, or several rubber bands.

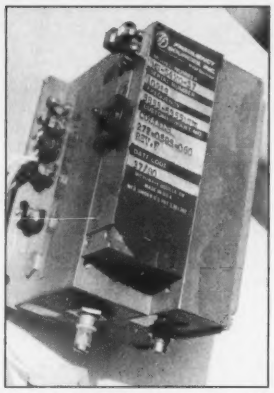

Photo A. The Frequency West 6 GHz PLL brick. It's mechanically similar to the 10 GHz brick. Remove the blue label on top to access the filter adjust screws.

When the unit is in this position you have access to the real tuning screws. (Note: Some units have an access plate on the back portion of the module which you must remove to give clearance to the inside Allen filter screws). The screws on top are lock screws (Allen head 0.035 inch), and the Allen screws on the inside of the multiplier assembly, just under the lock screws, are the filter adjusting screws.

Movement of the filter screws is not radical, and filter alignment will be facilitated with less than one turn of the set screw. Go slow. Unlock the locking screws first, and only then, when you are ready to observe power or output on a spectrum analyzer, make filter adjustments. I have not worried about passband results, just peak power output at the frequency of interest.

Once the proper frequency is reached, you can insert the crystal into the circuit and attempt phase-lock. The crystal is adjusted by turning a small variable capacitor while watching the "XTAL" lead on the side of the brick for DC voltage output. A voltage of about 0.5 VDC indicates that the crystal is oscillating. Adjust the cavity tuning screw while watching the "0" or phase-lock terminal. Normally, out-of-lock is a steady negative 10–13 volts. This voltage will jump to a value of between 2–13 volts. When in-lock, this voltage will follow small adjustments of the cavity tuning screw.

When phase-lock is obtained, you should be near the exact microwave frequency desired. Slight adjustment of the low frequency oscillator circuit will obtain the desired results. This, of course, depends on the crystal being set to exactly the proper frequency. For example, in my brick I wanted a final frequency of 10.223 GHz (10223 MHz). This required a crystal of 100.2254902 MHz, the 102th harmonic of which is exactly 10.223 GHz. Close enough for government work.

Now, with phase-lock and proper frequency output, you can do a final adjustment on the filter for peak output, then lock the adjustments down. I usually obtain +7 to +10 dBm power output, plenty of power for a mixer at 10 GHz. Final adjustments take time, as you might have to jiggle both the filter

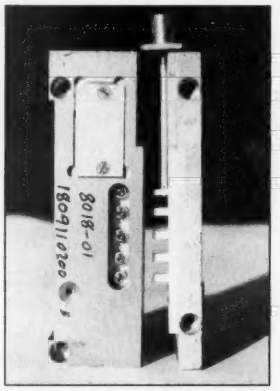

Photo B. The 10 GHz filter assembly. Note the 5-pole filter elements. The last element is connected to coax with an SMA output connector. When the filter is assembled, the five elements are next to and under the lock nuts of the five screws on top of the filter body. The filter elements are inside the filter body. Screws and lock nuts are under the blue factory label, and the four mounting holes are on the filter's edges.

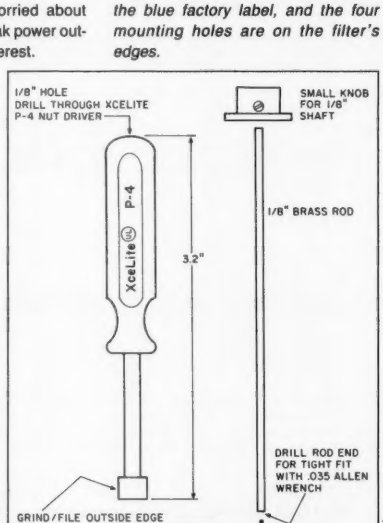

Figure. You can modify a nut driver to construct a tool for brick filter alignment.

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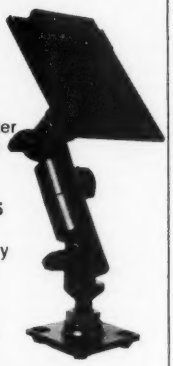

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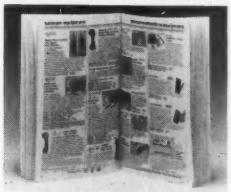

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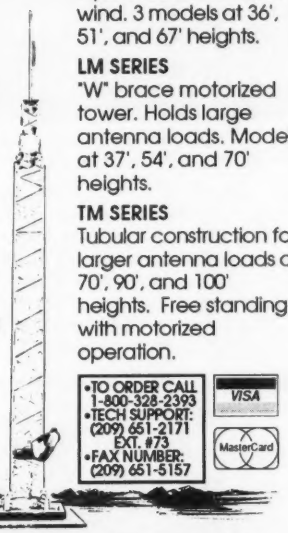

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and lock screws. There is some displacement of the adjustment screw when the lock screw is tightened, and both screws must be done together or all is for naught. Balance the lock screw's action with the adjust screw; it's a matter of feel, and you will see what I mean when you try it.

Adjustment Tool

It's difficult to adjust the screw and lock nut with an Allen wrench and a pair of pliers. To overcome this problem, I constructed a two-stage tool by modifying a standard nut driver that fits the lock nut. See the figure for details. The nut driver is modified by first drilling a hole about 1/8-inch in diameter through the length of the plastic handle so a solid brass rod can be inserted through the nut driver, handle and all. I used an Xcelite™ P-4 nut driver (0.129-inch hex head nut driver).

In turn, the brass rod is drilled on one end to accept the 0.035-inch Allen wrench. Brass is soft; under-drill the hole slightly, at about 0.032 inches, so the Allen wrench will fit tightly. The hole will expand slightly to accommodate it. On the other end, attach a small knob to the shaft. Use the nut driver to unlock the lock nut, and the Allen screw to adjust the filter element. While holding alignment steady, the lock nut is turned tighter. You will have to do this several times to obtain maximum output on each filter element.

The procedure is the same for those bricks with top locking screws and a side filter. In this model, you may have to use two Allen wrenches. On both filter assemblies there is a small potentiometer that should be left alone unless you have high output on 11 as well as 10 GHz. This is the bias adjust for the SRD multiplier diode. It's best adjusted while watching the oscillator on a spectrum analyzer for minimum high harmonic output.

And that's it. If you removed the multiplier assembly, reassemble it by rotating it 180 degrees and replacing the four screws that you originally removed. The probe into the RF compartment is self-centering.

A small rubber boot can be made to cover the crystal, forming an insulator for the oven assembly. You can construct one out of about an inch and a half of monkey rubber tape, which is available at most hardware stores. When stretched slightly, the tape will adhere to itself. I wrap it around the crystal heater and fold the excess on top of the crystal, making a little box affair to shield the crystal from draft and maintain temperature stability.

Brick Availability

These surplus brick oscillators are being removed from commercial telephone service. As more and more older systems are being replaced with digital and light guide facilities, surplus channels will acquire more and more of these oscillators and other high quality microwave components useful to the amateur microwave technician.

I have picked up a small quantity of the 10 GHz phase-locked brick oscillators, and will make them available for $50 postpaid in the U.S. If you want me to re-tune the output filter to 10.223 GHz, I will be glad to do so for an additional $15. It takes about a half hour to completely tune one up.

By the way, the crystal used in these oscillators is available from International Crystal Co. and costs about $20. Specify Frequency West part #585132 and the type of brick you have, such as Frequency West 54XOL output frequency 10.223 GHz.

Other articles in *73* have covered these brick oscillators. Check out June and July 1990 for temperature control and typical internal crystal oscillators. Full details with block diagrams covering a 5 GHz brick were in the September 1990 "Above & Beyond" column. For the 10 GHz brick system, see this column in the December 1989 issue.

That's it for this month. I'm getting ready for the 10 GHz ARRL contest and will update you on operations and any unusual happenings. As always I will answer questions concerning microwave and related topics. Please enclose an SASE for prompt reply.

73 Chuck WB6IGP

Number 19 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS /Hamhelp SIG. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 525–4438). Use upper- and lowercase letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

Can anyone help a DXer to get some old-fashioned transmitter and modern-day shortwave sets? A Yaesu FRG-8800, any HW101 homebrew 21 MHz CW transmitter, and a 21 MHz shortwave, would do good for DXing. Thanks. *Mac Arthur Herman Moore KA3LLY, 5230 Heston St., Philadelphia PA 19131.*

Wanted: Schematic and/or manual for Eico Model 315 Signal Generator. Will pay copy and mailing costs. *Larry Keith KF8BX, 4251 Meadowsweet Dr., Dayton OH 45424. Telephone: (513) 233–1148.*

I need a schematic for a Regency HR2-A 2m FM radio for a new ham in my radio club. Please send reply to *Steve Lempke WA1MZL, 1538 N. Main St., Fall River MA 02720* or call *(508) 675–9923* after 5:30 PM EDT. Thanks.

Donations needed for an expedition: 6 meter SSB-CW rig, 100 W S.S. Amp & Beam, 2 m SSB-CW rig, 150 W output amp., 1 superlong yagi. Purpose is to give out new countries on 2 meter EME. Please send packages (marked "GIFT") to *PS7KM, Karl Mesquita Leite, Box 385, 59000, Natal, RN.* Thanks, from John WB8IGY of Cincinnati OH.

Wanted: Schematic and Manual for the Motorola U43HHT Low Band Rig, Receiver and Transmitter. Please mail to *9Y4VU, Franklin Brooker, 43 Seaview Dr., Battoo Lands, Mirabella, Trinidad.*

Wanted: August 1984 QST magazine or copy of the article entitled "Some Basics of VHF Design and Layout." Also, service manuals for Uniden HR-2600 and Heath HWS-2 HT. *Glenn KB5AYO, RT. 1 Box 580-B, Reserve LA 70084.*

Varian G-10 Chart Recorder. Need schematic and/or manual. I intend to solid-state it. Will pay copying and postage. *Brian WA5PPO, 6848 E. 45 St., Tucson AZ 85730-2214.*

HAMSATS

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Andy MacAllister WA5ZIB
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Satellite Operation Today

A decade ago, few would have believed the day would come when there would be so many operational amateur radio satellites that one could be above a station's horizon almost continuously. Today we have 13. If you count the Russian space station *Mir*, with its 145.55 MHz packet BBS, we have 14. With multiple transponders on most of the spacecraft, satellite chasers have many options ranging from HF to microwave activity.

Although some might consider the HF transponders on RS-12 and RS-13 for relatively short-range contacts, others have found them to be a medium for worldwide communication. Using the Mode K transponder on RS-12 (uplink 21.210–21.250 MHz, downlink 29.410–29.450 MHz), over-the-horizon DX is possible when skip conditions permit it. A complete frequency chart for RS-12/13 is in the May 1991 "Hamsats."

For the UHF and microwave enthusiast, the Mode S transponder on AMSAT-OSCAR-13 (uplink 435.603–435.639 MHz, downlink 2400.711–2400.664 MHz) has provided many opportunities to work with 2.4 GHz equipment and make worldwide contacts via satellite.

Most satellite chasers prefer Mode A (2 meters up and 10 meters down) via RS-10/11 or Mode B (70cm up and 2 meters down) via A-O-13 or A-O-10. While RS-10/11 is in a low-earth orbit (several hundred miles high), A-O-13 and A-O-10 are in highly-elliptical orbits, traveling out past 20,000 miles at apogee, the orbit's farthest point from the earth. Even though the elliptical orbit satellites have gain antennas and high power transponders, ground stations will need quality antennas and expensive equipment for easy contacts. The RS-10/11 station is usually less complex, but the satellite's coverage is also less, due to the lower orbit.

Since the launch earlier this year of RS-14, also known as RADIO-M1, RUDAK-2 or AMSAT-OSCAR-21, hams have had a Mode B transponder in low-earth orbit requiring only omni antennas like ground planes for consistent contacts via satellite. The May 1991 "Hamsats" also had a frequency chart for this hamsat.

Simple Earth Stations

Getting active via satellite can be easy. To work RS-10 Mode A, all that is required is a good 10 meter receiver with a dipole and a 2 meter transmitter capable of CW or SSB with an omni-directional antenna.

Some FM rigs are capable of CW uplink by keying the microphone push-to-talk switch, but many will exhibit excessive chirp with this method. It's worth a try. An alternative is a used, multimode 2 meter rig. One can usually be found for a few hundred dollars at a swapfest. Inexpensive older rigs to look for include the Kenwood TS-700A, the Yaesu FT-480R and the ICOM IC-251. A simple quarter-wave ground plane antenna for 2 meters can be purchased or made from coat hangers and a SO-239 connector. The Lakeview Co. model GP-10-2 by WD4BUM is a very nice ground plane that can be quickly assembled for easy portable operation. Another good choice would be the MAX System ground plane antenna from Cellular Security Group.

On a recent trip out west, I used a Lakeview antenna for many successful contacts via RS-10. My uplink power was about 10 watts through 20 feet of RG-8 coax. For the downlink, I stretched a dipole made from hook-up wire between two trees. The feedline was a short run of RG-58 to a Uniden HR-2510. Although a small MOSFET preamplifier was available, it was not necessary for most contacts. A 12 volt power supply powered the radios, but a battery would have done the job as well.

Operation via the Mode B linear transponder on A-O-21 proved to be just as easy as A on RS-10. Ten watts to the 440 MHz version of the Lakeview ground plane proved sufficient for quality contacts whenever the satellite was above the horizon. A GaAsFET preamplifier was employed for the 2 meter downlink. It wasn't necessary, but it helped during times when the satellite was low in the sky.

Although I didn't try it during the western trip, mobile operation should do very well on A-O-21. A single quarter-wave whip for 2 meters could be used for both 70cm uplink and 2 meter downlink. A diplexer would be needed, but they have become very common in recent years due to the popularity of dual-band mobile operation through FM repeaters. For those interested in building their own, the September 1989 issue of *Ham Radio* presented a very simple, easy-to-build diplexer in the "Ham Notebook" column.

The success of A-O-21 activity with nothing more than ground plane antennas was inspiring. AMSAT-OSCAR-13 was oriented to provide excellent signals after apogee (when the satellite is closer) rather than during. I had been able to hear conversations in the passband with the ground plane and preamp, so I tried the 70cm uplink. Signals were so weak I could barely hear my own CW, but it was there. After several attempts at contacts, a very patient WD6EPV came back with an answer to my call. Ten watts to a ground plane is not much for contact via a satellite 15,000 miles away, but it will work under optimum conditions, and if the operator on the other end has a good system and an excellent ear.

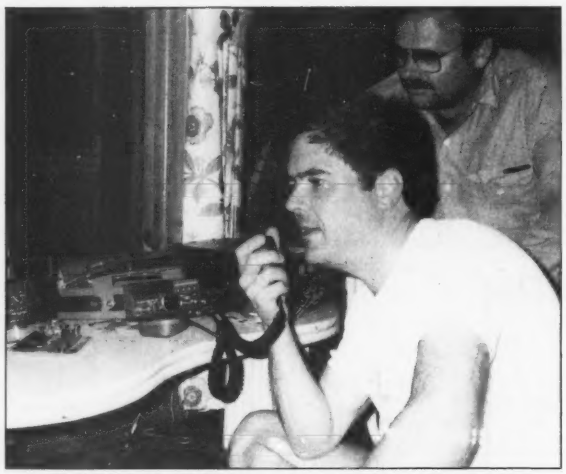

Photo A. WA5ZIB and WA5WOD with portable station in central Texas.

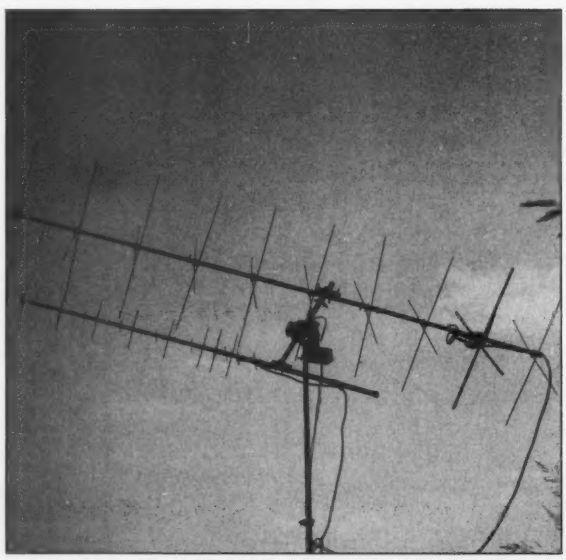

Photo B. Typical Field Day satellite antenna system for 2m and 70cm.

Other Simple Systems

It's not necessary to see how small an antenna system can be and still work for satellite activity. A few hams have put their stations in backpacks and used shoulder-mounted beams to make contacts via the high-orbit hamsats. Others have had simple, yet effective, stations on boats, and several have tried mobile satellite work. Field Day is another opportunity for innovative installations.

The idea is to use available equipment to make contacts via satellite, and add system improvements for more serious efforts as time and money allow. An omnidirectional antenna on 2 meters can be the beginning of a home satellite system with the inclusion of almost any 10 meter rig and antenna. For that matter, the simple 2 meter home antenna could be immediately put to good use making contacts with U5MIR-1, the packet BBS on *Mir* (145.55 MHz FM simplex). Similarly, signals from DOVE-OSCAR-17 and UoSAT-OSCAR-11 can be monitored with simple systems tuned to 145.825 MHz FM.

The addition of at least one beam antenna with azimuth and elevation control marks the beginning of serious satellite activity. Expensive computer-controlled rotators are not necessary. Jack KA5DNP, author of "The Field Day Special—the 'Ray Gun' " in the June 1990 issue of *73*, doesn't use rotators at all, and has DXCC via satellite. Older TV rotators provides excellent service if you need remote control or who wish to pursue fast-moving, low-orbit birds. 73

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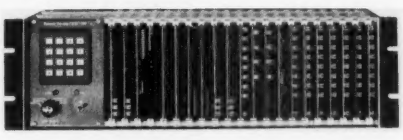

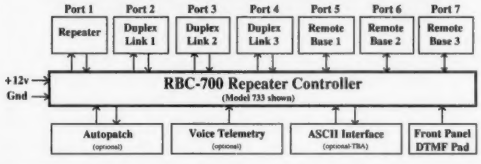

The RBC-700 Repeater Controller is designed to support Repeater systems that require multiple radios connected together at a site. The RBC-700 utilizes a true 7 x 7 audio matrix switch which allows several conversations between ports at the same time. In the illustration above the 733 model is supporting a Repeater, 3 Duplexed Links to different sites, and 3 Remote Bases. Using simple commands, a user could tie the Repeater and a Remote Base to one Link, while the other Links are communicating through your site, holding separate conversations. Or, connect all of the ports together - like a big party line !!

Several models are available and are software configurable to support up to 3 Repeaters, 5 Duplexed Links, and 4 Remote Bases. A group or club can start with the basics and **expand** their controller anytime by simply adding boards and software. Free software upgrades for one year after delivery. Finally, a real controller for the Linked system operator !

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Everything To Gain

Before we get to this month's topic, let me direct you to the table on page 73 listing those parts source addresses I promised last month. By no means does this list include all of the mail-order outfits out there, but it should give you a starting point. By the way, these names all come from catalogs I have here in my home lab. You, too, can get these catalogs, and most of them are free. I strongly recommend that you get as many as you can.

Now for our next topic: GAIN. What is it, and why is it so important? The foundation of modern electronic technology, including radio, television, the digital computer, and virtually anything else you can think of, is the ability to make a small signal bigger! Without that crucial function, we'd be back to crystal sets and earphones. We call this function "gain," and the devices which perform it "amplifiers."

I'll go out on a limb here by stating that the first device capable of signal gain was the triode tube, invented by Lee DeForest. I think there may have been some earlier, experimental magnetic devices, but the tube was the first to be widely employed. It ushered in the radio age and all that was to follow.

The Signal Itself

Before we can examine the phenomenon of gain, we have to take a look at what we're trying to make bigger in the first place: the signal. What is a signal? A signal is simply a changing voltage or current whose changes represent some kind of intelligence. It is easiest to think of it in terms of voltage.

Imagine a graph where the "X" (horizontal) axis represents time. The "Y" (vertical) axis represents the voltage. As the voltage changes over time, it draws a graph of the signal. That signal may be a sine wave, a pulse, or perhaps many waves whose overall level, or envelope, changes over the course of several cycles.

In any event, the signal will get smaller as it passes through the air in a radio transmission or through wires, because no path or conductor is without loss. (OK, perhaps a superconductor comes close, but we're not living in the superconductor age yet.) In radio, the strength of the signal decreases proportional to the square of the distance from the antenna. In other words, if you go twice as far away as you were, the signal is only one quarter as strong. If you go four times as far, it is only one sixteenth as strong. That occurs because the energy is spreading out to fill the surrounding area, so you are receiving smaller and smaller pieces of it. By the way, that's why satellite dish antennas for TV need to be so big: to collect enough of the satellite's extremely weak signal to be able to detect it.

Of course, radio is much more complicated than the "inverse square" law, which doesn't take into account ionospheric reflection and other phenomena. But at least you can see what we're up against. So how do we make such tiny signals useful? We amplify them, of course!

Two Ways to Make it Bigger

There are two kinds of amplification or signal gain: voltage gain and current gain. That may seem confusing, but it is easy to explain. Voltage gain is when the voltage swings of the input signal to the amplifier cause bigger ones at its output. This type of gain may cause a 0.1 volt peak-to-peak input signal to drive the amplifier to 10 volts p-p. That would be a voltage gain of 100.

Current gain is when the amplifier's output swings are the same size as its input swings, but the output can drive a much lower impedance load before getting bogged down and losing voltage. So, a signal that can deliver 2 volts p-p into 1000 ohms might be reduced to only 0.01 volts if you tried to drive an 8 ohm speaker with it. But a current amplifier can keep it at 2 volts into the 8 ohm load.

Now that we know what gain is, let's look at how it is produced.

Nothing: The Essential Factor

We all know that a tube is nothing more than some metal pieces and a filament inside an airless glass envelope. Nothing magical and theoretically complex like a semiconductor. So why does it exhibit gain?

Tubes use the natural tendency of electrons to accelerate when attracted through space to an opposite polarity. Specifically, if you boil some electrons off a hot electrode (a piece of metal) and put another electrode nearby, and then make the second one positive with respect to the first, the electrons will pick up speed on the journey and slam into the positive electrode harder than they were moving when they left. So what? Well, if you put yet another electrode (called a "grid") near the first one, you can block or let pass the moving electrons by putting a small amount of voltage (your signal) on it. It acts like a gate. In fact, the British still call tubes "valves," because that's essentially what they are.

When the traveling electrons, which are now varying with the signal, slam into the plate, they make it more negative (in other words, less positive) than it was before, and the amount they change it is proportional to how many electrons have been passed by the grid and how fast they were moving. And there you have it: gain! The output will vary with the input, only bigger.

Whew. Now you know why it took mankind umpteen thousands of years to discover this phenomenon. Also, having a vacuum pump helps, because you can't make this work at all if there is any gas (such as air) inside the tube. The electrons collide with the gas atoms and never make it to the plate.

Something Messy

Solid state devices do pretty much the same thing, only they do it not by attracting electrons through space, but by permitting them to migrate through certain kinds of materials which can conduct energy only under certain circumstances. I know that sounds vague but, believe me, the physics is messy and not worth getting into here. Essentially, it all comes down to a gate which either restricts or permits electron flow, along with the ability to magnify what flow there is. In transistors, that ability comes from the generation of "holes" of missing electrons in an atomic crystal lattice pattern, which can then be filled by other electrons traveling from another part of the transistor. See, I told you it was messy. The advantage over tubes is that no hot electrode is required, because the electrons don't have to be projected into space. Also, you don't need a vacuum.

Well, once again we're out of space, so we'll continue our discussion of gain next time. There's lots more to cover. 73 for now. 73

Source List for Components and Parts

Active Electronics
11 Cummings Park
Woburn, Massachusetts 01801
(800) 228-4836
(617) 932-4616

Geared toward the industrial customer, their large catalog has all kinds of parts, cases, production equipment, etc. Many items are available only in large quantities, but some can be had in singles. This catalog is worth it just so you can acquaint yourself with what's out there.

All Electronics
P.O. Box 567
Van Nuys CA 91408
(800) 826-5432

They have crystal oscillators, linear and digital chips, RAMs, connectors, etc. They also have some tools and test equipment.

BCD Electro
P.O. Box 450207
Garland TX 75045-0207
(800) 229-2239

Lots of stuff, including surplus and "RFE" (removed from equipment) components, at great prices. The latest catalog includes microwave FETs, EPROMS, disk drives, relays, etc.

Circuit Specialists, Inc.
P.O. Box 3047
Scottsdale AZ 85271-3047
(800) 528-1417
(602) 966-0764

A complete lineup of ICs, transistors, discrete components, connectors as well as computer components and boards.

DC Electronics
P.O. Box 3203
Scottsdale AZ 85271-3203

Chips, transistors, all the usual stuff. Also fiber optic kits, and a few construction kits, including a power supply and a function generator.

Digi-Key Corporation
701 Brooks Ave. South
P.O. Box 677
Thief River Falls MN 56701-0677
(800) 344-4539

The big player of all mail-order outfits. Loaded with components of every kind, including a very wide selection of semiconductors and capacitors. Not surplus prices, but this isn't surplus material, either—it's all top of the line stuff. Many established companies, big and small, go here first.

Hosfelt Electronics, Inc.
2700 Sunset Boulevard
Steubenville OH 43952
(800) 524-6464

Some semiconductors, caps, etc., but more relays, connectors and switches. Also some books and test gear.

Jameco Electronics
1355 Shoreway Road
Belmont, California 94002
(415) 592-8097

They've got a great selection of chips, including CMOS, TTL and linear. They also have lots of computer-related boards and accessories, and even motherboards and entire computer systems. Most of the computer stuff is PC-type, but good ol' Apple II is also supported. If you're into computers, don't miss this one.

MCM Electronics
650 Congress Park Dr.
Centerville OH 45459-4072
(800) 543-4330

Unique among the mail-order folks, this company emphasizes parts for Japanese consumer electronics gear like VCRs and stereo speakers. They also have test equipment and even home alarm systems! I mention them here because I have found them to be invaluable when I needed a part for some piece of household gear. Hey, we hams are supposed to fix *everything*, right?

Mouser Electronics
P.O. Box 699
Mansfield TX 76063
(800) 346-6873

Tons of parts, from semiconductors to microphone elements, resistors, caps, you name it. Several locations. The above address is for their circulation center.

KITS:

Well, the pickins are getting mighty slim in the kit field these days, what with Heathkit dropping their amateur radio line and all (sniff). Luckily for us, there's still a few companies out there making kits:

A & A Engineering
2521 W. LaPalma #K
Anaheim CA 92801
(714) 952-2114

A complete lineup of ham radio related kits and projects. Many of these are complete kits for construction articles in the various amateur radio publications.

Communication Concepts, Inc.
508 Millstone Drive
Xenia OH 45385
(513) 426-8600

Kits for amateur TV downconverters, amplifiers for HF, VHF and UHF, as well as a full kilowatt solid-state HF amplifier.

Down East Microwave
Box 2310, R.R. #1
Troy ME 04987
(207) 948-3741

All kinds of transverter and preamp kits for the microwave bands.

GLB Electronics, Inc.
151 Commerce Pkwy.
Buffalo NY 14224
(716) 675-6740

A number of kits for VHF and UHF FM transmitters and receivers.

Hamtronics, Inc.
65 Moul Rd.
Hilton NY 14468-9535
(716) 392-9430

Kits for VHF and UHF FM transmitters and receivers, receive converters as well as an excellent line of GaAsFET preamp kits and various accessories for repeater operations.

Kanga US
3521 Spring Lake Dr.
Findlay OH 45840
(419) 423-5643

Innovative QRP kits imported from England. Miniature HF receivers, transmitters and various QRP accessories.

MXM Industries
Rt.1 Box 156-C
Smithville TX 78957
(512) 237-3906

An excellent source of easily built, high-performance QRP receiver and transmitter kits for the HF bands.

North Country Radio
Box 53-A, Wykagyl Station
New Rochelle NY 10804
(914) 235-6611
(914) 576-6051 FAX

Quite a lineup of kits for amateur TV, FM stereo transmitters and receivers as well as unusual and innovative circuits. All their kits have been published in various magazine articles.

Radiokit
P.O. Box 973
Pelham, New Hampshire
(603) 635-2235

Plenty of ham-related kits, though many of these are a bit bigger and more expensive. From complete QRP transceivers to audiophile power amps, they have lots of neat stuff. In addition, they also carry PC boards for popular magazine projects, and will even sell you a copy of the article for a modest fee.

Ramsey Electronics
793 Canning Pkwy.
Victor New York 14564
(716) 924-4560

These folks have a nice assortment of really nifty little kits, few of which could be called expensive. Lots of really fast frequency counters, small superhet receivers for various bands, QRP transmitters and more. Even a downconverter for 900 MHz ATV. The place obviously is crawling with hams. A must-get catalog!

TEST EQUIPMENT:

Contact East
335 Willow Street South
North Andover, Massachusetts 01845
(508) 682-2000

Geared more toward the industrial customer, they sell soldering and test gear, along with tools, scopes and meters.

Elenco Electronics, Inc.
150 W. Carpenter Avenue
Wheeling, Illinois 60090
(312) 541-3800

Testing and prototyping gear, including scopes and meters. Also a few kits. Worth checking out if you're setting up a lab to homebrew.

Fordham Radio
260 Motor Parkway
Hauppauge NY 11788-5134
(800) 695-4848 orders
(516) 435-8080

A wide array of test equipment and accessories.

Global Specialties
P.O. Box 1405
New Haven, Connecticut 06505
(800) 345-6251

They make their own line of test gear and prototyping equipment. The breadboards are especially nice.

Jensen Tools, Inc.
7815 S. 46th St.
Phoenix AZ 85044
(602) 968-6231

You'll find just about any kind of tool here. This is the place to go for all kinds of miniature cutters, pliers and specialty adjustment tools. a lineup of test equipment is also featured.

Never Say Die

Continued from page 4

. . . and he knows me too. As does his father, the ex-governor . . . as does ex-governor Sununu and ex-governor Peterson. Bragging again? Nope, I'm explaining how you can help change things. And you won't do it by sitting there like a lump in a bog.

If we can get our schools back on track. If we can get 'em busy teaching science so our kids will be able to cope with the technology of 2000 and not have to call in the Japanese to fix their equipment, we'll have enough young hams to start contributing to the advance of communications again.

Is that a massive sigh I sense? Too much trouble, right? So okay, we're failing our kids. We're turning a blind eye to the educational mess they're in. Just as we are too busy to train our dogs to behave, we're too busy to bother bringing up our kids. Too busy doing what? "Don't bother me now."

Fathers talk with their kids 16 minutes a week . . . and that's the national average. No wonder our educational system is one of the worst in the developed world. No wonder our kids are so much more into cruising, drugs, sex, and beer than amateur radio and other scientific hobbies.

When I start hearing your 10-year-olds on your rig calling CQ, I'll know there's some hope. When I start seeing your kids at hamfests, I'll lighten up. When I start getting pictures from clubs showing bright young faces with calls, I'll find something else to fret about.

Pan Am and Airline History

A few years back I was able to get my father to write a series for *73* on his early experiences in aviation. I tried to get him to write more, since the reader reception was so positive . . . though it wasn't even remotely about amateur radio! But he only wanted to write about the positive things he'd been through and refused to tell the rest of the story.

With Pan Am's recent bankruptcy I got to remembering how much that company had affected my life. Well, how its president, Juan Trippe, had affected it. And Trippe's good buddy, FDR.

My dad got involved with flying right after WWI, learning to fly in 1921 (pilot's license #73) with the Army in San Antonio. I was born the next year and within months he was taking me up with him. I grew up around the big Martin bombers at Langley Field in Hampton, Virginia, where he flew with Jimmy Doolittle . . . the chap who tried to convince the Army that airplanes had a future and could even sink ships.

After leaving the Army he barnstormed for a while and then worked for the Department of Commerce, giving pilot tests and putting together the first guide to American airports. He had commercial pilot's license #89.

This led to his being hired to design and build Philadelphia's Central Airport. Then Jim Eaton of Luddington Airlines hired him as passenger and cargo manager, so we moved to Washington when I was nine. When Luddington sold out to Eastern Air Transport in 1933, he and Jim decided to start a New York to Boston airline. Marine Airlines would use flying boats and go directly from downtown Manhattan to downtown Boston, cutting the commuting time substantially.

The other airlines were enthusiastic about connecting to this new service, so they provided the needed investment. Except for Trippe of Pan Am. He'd been using flying boats on his South American flights and was worried about his turf. He didn 't want any other airlines using flying boats.

Pan American was our only overseas airline at the time, so Juan Trippe cultivated FDR as a friend as a way to help protect this edge. A whisper in Roosevelt's ear resulted in an Executive Order that no airline could own stock in another airline. Today, if a president were to do that, the press would be all over him and raise hell. There wasn't much accountability then, so FDR and Trippe got away with it and Marine Airlines was sunk before it ever got going.

Tough break. Two years of hard work torpedoed. But that's the way it is with entrepreneurs . . . they gamble on an idea. Sometimes it pays off and sometimes a catastrophe comes along and blooie.

Jim and Dad didn't funk for long. They thought big. OK, then how about a trans-Atlantic airline? They got together with the owners of American Export Lines, the largest American steamship line, and convinced them that air travel would eventually eclipse ship travel. This was around 1936, mind you. Pan Am had expanded into the Pacific, so it didn't take a lot of convincing to get American Export to see the writing on the wall.

My father headed for Europe to set up bases for the planes. Most of American Export's ships cruised the Mediterranean, so that's where he spent about a year setting up seaplane base agreements with the governments. I'd get postcards from Oran, Genoa, Alexandria, Beirut, and Tripoli.

I've got a bunch of pictures I took of the PBY they used for the survey flights in 1938–1940. Dad set up a seaplane base in Botwood, Newfoundland, for the summer crossings and others in Belem, Brazil, and in Dakar, Senegal, for the winter crossings. Just as they were getting going with regular passenger service we had a little war, so the Navy used the airline for their purposes.

Trippe was not happy about all this. He kept pushing Roosevelt to have America allow just one international airline . . . Pan American Airways (PAA). It was called a "chosen instrument." With Britain backing BOAC, France doing Air France, and so on, he urged FDR to choose PAA. Roosevelt agreed and shortly before he died he issued an Executive Order saying that no steamship line could own stock in an airline.

American Export, having invested millions in the project, and having had to let the Navy use it through the war, was furious. Trippe offered to buy American Export Airlines, but he didn't offer much. The American Export people said hell would freeze over before they'd sell to Trippe.

American Airlines made an offer, so it became American Overseas Airlines . . . for about a year. Then American sold it to PAA. Sneaky deal. But long before PAA took over, American had eased out the Export management by putting their own managers in over them and taking away their authority. They didn't fire them, of course.

Jim didn't take this second setback well and soon died. My father went fishing. But not for long. Aer Lingus, the national Irish airline, wanted a trans-Atlantic division, so they hired Dad to set it up.

He spent the next couple years building the new airline for Ireland. It meant setting up ticket offices, buying planes, hiring and training crews . . . the works. Then, a few weeks before the inaugural flight, there was an election in Ireland and De Valera was ousted as Prime Minister. The new chap came in promising economy, so he immediately stopped the airline . . . despite tens of millions of dollars in presold tickets.

Dad sold off the planes for them, helped the employees find other work and closed down the operation. A few years later De Valera was re-elected and Aer Lingus asked my father to build Irish Airlines again. He said no. Ireland managed to waste hundreds of millions and set themselves back years with that dumb political move.

A few years ago, when I decided to set up a software operation in Ireland, I visited Jack Kelly-Rodgers, who'd been the president of Aer Lingus and had visited us many times in Brooklyn, and we reminisced over how badly that debacle had hurt Ireland.

Even after three crushing disappointments my dad was game to have a try at building a helicopter plant for Kamman. He took a room in Suffield (CT), coming home on weekends, and organized the factory for Kamman at Bradley Field. It was the first time anyone had gotten the Navy to put up the money to build a factory.

The son of the people he lived with recently got his Novice ticket . . . small world department. And Kamman's son

QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year Subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

is in the music business making guitars.

Entrepreneurship

While being an entrepreneur doesn't always pay off. . . and never did for my father, so we never had much money. . . it's sure more exciting and fun than working for a large business. Not having money was good training for me. And with both my father and my grandfather being entrepreneurs, it was natural for me to go that route.

Sure, I've made some money, more by accident than on purpose, but that hasn't changed my frugal habits. All of my money has been invested in providing jobs for people as I spin off one new company after another. Some of the people have done well with my money, others have wasted it. . . and themselves in the process.

The huge publishing conglomerate I sold eight years ago has now almost completely disintegrated. None of the seven magazines has prospered in recent years and all but two failed. My huge software firm is gone. Even the book publishing business is gone.

I saw all this happening, but was unable to change the corporate management approach which was at the heart of the failure. The October *Analog* has a fascinating article on what went wrong with the Hubble telescope. Too bad if you missed it. The author points out that all successful scientific endeavors have had one man ramrodding them through. The Hubble was a group-managed project. . . and thus became a horrible, expensive disaster.

The Manhattan Project seemed like a group effort, but there was one man fanatically following every detail. . . Robert Oppenheimer.

Entrepreneurs tend to succeed because they put their whole lives into their work. Groups tend to fail. Just ask the Russians.

None of the seven magazines and other businesses I sold should have failed. None would, I'm convinced, if there had been an entrepreneur running them instead of accountants. Why, it's almost enough to make a person think!

Dan Quayle recently attacked lawyers, pointing out that America has 70% of the world's lawyers. They're an easy target. . . and a valid one. But we need to wrest control of American industries from the accountants as well as the lawyers. Accountants should be there to help entrepreneurs know how they're doing, and should not be permitted to make financial decisions.

Corporations have to file tax returns and this means a horrendous amount of accounting has to be done for the government, which refuses to pay for it. These tax figures are almost useless as far as running a company is concerned. Entrepreneurs need to deal with cash flow, which includes things such as accounts receivable and payable aging.

The League, Again

With no-coders coming into the hobby by the thousands, there could be some opportunities for entrepreneurs to provide Tech-oriented products. But don't get carried away quite yet. While our growth appears to be about 100% ahead of last year at this time, remember that we still only have about 20% of the growth amateur radio experienced for 18 years after WWII . . . until the ARRL pulled the whole works to a screeching halt in 1964. While most of the chaps responsible for nuking the hobby are now dead, I'm not sure we shouldn't remind ourselves now and then of what damage the League has done and how little it's done to promote hobby growth. Sadly, there are thousands of amateurs who truly believe the self-promoting propaganda they put out. I've never loved or hated the League. I've just been amused by those who do love or hate it. That's about as smart as loving or hating the Republican or Democratic parties.

Yes, of course the League does good things. Always has. Unfortunately, as a ham editor and publisher for the last 40 years, I've been privy to the inside skinny on what's really been going on, something few hams outside the industry have any way of knowing. A little quiz: How much do you know about the Doyle letters? He was an ARRL director who really spilled the beans. They were busy trying to cover up that mess for years.

And why did Herb Hoover resign as president of the ARRL? And how was the ARRL involved with W2AOE's suicide? How did a sneaky (and probably illegal) ARRL deal with Hallicrafters completely ruin the ham exhibit at the New York World's Fair? Tell you what—if you'll get off your butt and elect some new and younger directors, I might shut up about the ARRL.

No, I'm not mad at the League. Exasperated perhaps, when I see the things that need to be done that they're not doing. And I sympathize with David Sumner, whose hands are pretty well tied by the directors, few of which have much business experience or detectable foresight.

I was just listening to a tape of an ARRL president giving a talk to a ham club where he admitted under questioning that the published board minutes in *QST* are laundered. Perhaps whitewashed is a better term. Having gotten years of earfuls from frustrated directors, I knew this was true, but I'd heard many true-believers angrily deny that any such skullduggery was possible.

When I asked Budlong W1BUD, the ARRL general manager, why the League was fighting the proposal for RTTY to be permitted below 2 meters, he explained that the League had always fought any rule-making proposal not submitted by them, no matter how beneficial to the hobby. Otherwise the League might lose control. I can't recall when the League has deviated from that policy in the 50-plus years I've been a member. Either you get your rules changed through the League or face an endless fight with them. Years later Bob Booth W3PS, their attorney, confirmed that this policy was still basic.

We succeeded in getting RTTY on the low bands, but it took several years of fighting the League. And look how long it took to get a no-code ticket!

So, following in my father's and grandfather's footsteps, I've been an entrepreneur most of my life. I've tried to help amateur radio grow and be more fun. No, I don't take it very seriously. But then I don't take anything very seriously. I try to call a spade a spade in my editorials and talks and encourage hams to have fun and keep our hobby clean. On that measure I guess I have to admit to being a failure. Oh, I've helped with the fun, but our hobby isn't much cleaner than it was 60 years ago. It isn't much worse, either, so perhaps that's a success, considering how much worse almost everything else in the world seems to have turned.

As my 69th birthday passes, I'm more and more aware of my mortality, with so many of the Silent Keys much younger than me. I'm discouraged that there don't seem to be any other voices speaking up for our hobby. The pages of *73* and *Radio Fun* are wide open for intelligent, creative ideas on improving amateur radio. Hello, anyone alive out there?

New Use for CB!

The Scripps Clinic in La Jolla has been messing around with 27 MHz. Lord knows how they got onto this one, but they've been sticking 27 MHz radiators into the mouths of 30 insomniacs for 20 minutes three times a week. Another 30 got no RF as a control. Wouldn't you know that the insomniacs went to sleep 52 minutes faster than the controls and slept 1.5 hours longer!

The next time you hear some old fossil beefing about CB you can point out that it has at least one sterling virtue . . . it puts people to sleep. No wonder, I often find that just listening to CB puts me to sleep.

Now I'd like to know what power levels they're zapping those insomniacs with. . . and if they've thought of testing 27 MHz against 30 MHz? Who knows, 10m may be an even better sleep inducer.

This bit of esoterica was reported at the annual meeting of the Bioelectromagnetic Society. I'll try and find out more about this for you. I don't have any trouble getting to sleep, but judging from some of the late night QRM, others may. . . so perhaps a 10 meter lollipop could help get you to the Land of Nod.

Are You Bo-ring?

Even packet and RTTY contacts can be excruciatingly boring when you run into a ham who has absolutely nothing to say. A recitation of the equipment, weather report, and signal report don't make much of a QSO. When that happens you know you're up against still another slow-witted proof that they don't give intelligence tests along with the code test.

One of the things I particularly enjoyed about RTTY back some 40 years ago was the ability it provided me to write some interesting stories and store them on punched tape. I've suggested doing this with tape cassettes, but it hasn't caught on. Today it's simple to store any number of stories on floppy disks and download them onto packet or RTTY. . . if you ever take the trouble to put them together.

Have I ever told you about the time when my fast-thinking saved my submarine from being sunk? Or the time when I came that close to being killed by the Shifta while on a hunting safari in northern Kenya? Or the time a drunk tried to stab me in the heart with a hunting knife? Or my strange first contact with China? Or some of my hairy flying experiences with my own seaplane? What it was like when I operated from Swaziland and Lesotho? Or from the king's palace in Jordan? Or the biggest crook I've ever met in amateur radio?

I'd love to have these recorded and quickly available to play, but even DAT tapes take 10 to 20 seconds to cue up. We need something faster, so I'm looking forward to Sony's new minidisc (MD) technology, where I'll be able to record over an hour of stories on a tiny disc and access any track I want in one or two seconds.

Using the same medium I'll be able to use either voice or an ASCII file and dump it via CW, RTTY, AMTOR or packet. I don't know how popular MDs will be for music, but they could be a boon for hams.

Of course I'm presuming that you have something of interest to talk about. That you've seen some interesting movies, watched some interesting TV shows on PBS, read some interesting books. . . etc. Alas, a dismayingly large percentage of the public doesn't or can't read. Plus they've never gone anywhere or done anything.

If you'd get your station set up for a combination of packet and slow-scan, you'd be able to set up whole libraries of short slide shows, complete with commentary, all accessible via a menu by the chap you're in contact with. Then, instead of just telling you about my visit to the Palace of Nebuchadnezzar, a few miles from Baghdad, I could show you some fascinating pictures, too.

Or perhaps you'd like to see how they bake pita bread in Tehran by sticking the loaves to the sides of igloo-shaped ovens? Probably not, eh? Well, how about some slides of sharks, barracuda and gorgeous coral? Or lionfish in the Red Sea? Or my DXpedition pictures from Navassa in 1958 or 1973? This isn't quite practical yet, but it could be within a year if someone would do the software.

A recent letter from Walt AH6HU suggests it's about time for some concentration on developing ham software. We need some macros to simplify log keeping and combine it with QSO files. We need to be able to make satellite or *Mir* contacts without having to shuttle between satellite tracking, log-

ging, and word processing programs . . . loading and unloading, with attendant waits for our struggling processor to wade through the top-heavy software. If you'll get started writing some software we can publish, we'll even help by making it available both on floppies and via our BBS.

The more we can use our computers and other storage systems to enhance our QSOs, the more fun amateur radio will be, both for us and for the people we get in contact with. Let's head toward multi-media, using packet, voice, computer storage, SSTV and so on, gradually getting ourselves into the 1990s in technology. And let's start seeing some articles from you on how to do it.

What's Been Your Contribution?

What are you really good at? Is there anything where you're a local expert? A national expert? A world expert? Any skill or field where you stand out? Or are you satisfied to be mediocre? Are you a star in some field . . . or just an anonymous cypher?

In amateur radio each special interest has its stars: W3CUL for traffic handling; W2QHH for certificate hunting; W6AM for DXing; W2BFD for RTTY; W8JK for antenna designing; W6KG for DXpeditioning; W1FZJ for Moonbouncing; W2KPL for ATV.

What separates the stars from the mediocre? Passion. Passion goads the star into working a little harder and longer than anyone else in one niche. It's surprising how little extra effort it takes to begin to stand out in your community . . . in your company . . . in your club.

I got fascinated by the idea of digital communications (RTTY) back in 1948. By 1951 I'd gotten so fed up with the lack of communications in the field that I started a newsletter . . . *Amateur Radio Frontiers*. Soon I was an "expert" and was asked to do a column in *CQ*! I started giving talks to ham clubs and wrote the first RTTY manual. My RTTY column led to my becoming the editor of *CQ*.

Is mediocrity genetic or is it learned? When there's a call for help by your ham club, are you right up front, anxious to do something? Club presidents are always complaining that 90% of the work for the club is done by 10% of the members. In which group are you?

At work . . . whatever kind of work you do . . . are you satisfied to be mediocre? How many magazines do you subscribe to which will help you learn more about how to do your work? How many books have you bought in the last year on the subject? How about adult educational courses in nearby schools? How about professional symposiums and conferences? If you're not taking them, should you at least be teaching them?

What aspects of amateur radio are you into? Tried packet yet? If so, have you given any talks to your club on the subject to try and get other club members interested? Ditto satellite communications, moonbounce, UHF experimenting, ATV, SSTV, and so on. Or are you a mediocre ham with only the most vague understanding of 90% of what the hobby has to offer? Are you merely a rag-chewer, satisfied to get on the air and mindlessly repeat the same garbage over and over for years?

If you're in sales, could you get up in front of a sales meeting and teach a group of salesmen about selling? If you're a manager, are you up to teaching a management group about managing? Or have you been getting by without really knowing much about your craft . . . without reading about it daily . . . without trying to learn more?

There's a big difference between getting very good at something and becoming a true expert. My rule of thumb has been to work at a new skill or interest until I'm in the top 10% of a group of people involved with that interest. After that, the amount of time it takes to get better at it starts to escalate logarithmically and you're headed toward being a one-interest person.

Let's say you decide for some weird reason to get good at working DX. You'll find there are few guidelines in the ham magazines about this. Even the DX bulletins don't cover the subject. They're almost 100% involved with lists of rare DX stations, their QSL managers, times and frequencies.

Okay, how good do you want to be? Some hams are so totally involved with working DX that they are monomaniacal on the subject. A rare DX station will keep them home from work . . . even from their son's graduation. I'd suggest setting a goal of 300 out of the 400 possible countries. That'll put you well up in the 10% stratosphere in most DX clubs.

If you're going to work 300 countries you're going to need time, good equipment and a lot of expertise. You can make up for any shortcomings in one department by spending more time in another. Howie W2QHH got to the top of the certificate-hunting pile more by dedication to his pursuit than by having a big signal. But a big signal will sure cut down on the time it takes. And it's more fun with a big signal.

It doesn't take much power to get through on a clear channel, so why the kilowatt and the beam? That's to clear the channel. You can't get to be a superb photographer with a Brownie. So figure on spending some money on your interest, whatever it is. Get good equipment. If you're into music, get a damned good hi-fi system. If you're going to rack up a DX score, put up a good, high tower, crown it with a single-band beam, add a kilowatt amplifier, and you're ready to start clearing your frequency . . . to jump into the pile-ups and come out with the prize while you're still smiling.

Your big signal is fine. That's like having a Weatherby for hunting (Weatherby was a ham, by the way). You still have to know where to hunt and how to find that elusive prey. This means getting DX bulletins. It means checking into the DX nets. It means a 2 meter link with other DXers. It means getting damned good at winning DX contests, for that's when some of the really rare spots are activated. That's

when your big signal will pay off.

You still have to learn operating tricks. How to tail-end without aggravating the DX op. How to get your call across fast. How best to come out on top of the piles. How to find the rare ones. How best to deal with list operations.

Sure, I've worked something over 350 countries . . . and I did it without losing my perspective . . . without becoming a DX addict. If you've got a good signal you should be able to work a hundred countries in one DX contest weekend on 20m SSB. I did. Two hundred took me a month. Three hundred a year. From there on I stopped being serious about it and caught the rest by accident.

I went about learning to be a competition driver the same way. I got a good car (Porsche), took lessons from some top racing drivers, and practiced on some top race tracks.

Same with rallying. I got the best in equipment, drove for some top navigators to learn, then developed my own rallying system and then started teaching it to other navigators. The next thing I knew I was importing special watches and computers for rallying and advertising them in the car magazines. I developed my own special tables for navigators and those using my system were usually the winners.

Once you're over 300 countries it's time to ease off and start using your big signal for less predatory purposes. It doesn't hurt to have that signal for RTTY or packet. Or you might get involved with contests and start collecting awards. Once you get good at contesting, it's fun. Oh, it's a real bummer for the hams who just want to ragchew, but contests only come on about 50 weekends of the year, so don't pay any attention to those milksops. Ignore them. Crush their pitiful bleats with your Big Signal.

Once you get used to no longer being mediocre you'll find yourself getting elected president of your ham club . . . or any other club you join. And that's fun, too. It's a challenge. Now you're in show business. And once you're more than mediocre you're going to be a lot more interesting to talk to on the air. You're going to have interesting things to say. You're not going to be stuck way down there in that sorry rut of reciting your name (oops, pardon me, handle), rig, antenna, weather, and over to you.

40 Years?

Yep, I started publishing my first ham magazine 40 years ago, in June 1951 . . . complete with long editorials. I did it because I couldn't get anyone else to do it . . . and it needed to be done.

In 1936 I was just another fat 14-year-old teenager. Then an angel . . . or perhaps a devil, depending on your perspective . . . stepped in. My boyhood chum, Alfred Lake (Alfie), and I were in church (Dutch Reformed) one Sunday when a chap came in carrying a big carton of radio parts. Rather than throw them away he gave 'em to Alfie. Alfie took one look and asked if I was interested. Sure!

We read about angels coming or being sent down by God to do good things. But the Devil himself seems to get involved with the bad things. I guess he doesn't have as big a staff . . . or maybe as much to do. Yet, when you consider the number of bad things happening compared to the good, El Diablo must run a very tight ship. I don't believe for a minute that government employees go to heaven, but God must be using a similar management system.

Anyway, the box of radio parts got me to checking my *Popular Mechanics* back issues. I found an article on building a cigar-box radio which used my parts and put it together. Then either one of the best or the worst things of my life happened . . . it worked! I was hooked.

My high school (Erasmus, in Brooklyn) had a radio club (W2ANU), which I joined. Naturally I started studying for my ham ticket . . . and eventually became W2NSD.

Cut to 1948. After four years in college and another four in the Navy (WWII), I was working as chief cameraman for WPIX-TV, the *Daily News* station in New York. I set my 2m ham station up on the 37th floor, complete with a 16-element beam on the roof. Big stuff in those days.

But hey, what was that weird beedle-beedling up on 147.96? Turned out to be John Williams W2BFD and a bunch of other RTTYers talking with each other. Hmmm, Teletype, eh? It didn't take long before I'd built my first RTTY unit and was pecking away on a Model 12.

There was quite a crowd on the channel, all with automatic start and stop RTTY systems so they'd work just fine unattended. We had clocks on 'em which allowed us to selectively call any individual at so many minutes after the hour. If we turned on his machine during the one minute interval we could hold it on and leave messages. Several of us even built in a system to get an answer-back acknowledgement that the messages had been received. Not bad for over 40 years ago, eh?

I was having so much fun that I wanted others to find out about it so they could have fun too. I tried to get John to start a newsletter, but the best he'd do was send out bulletins on RTTY. Well, that wasn't going to help attract newcomers! We needed an RTTY newsletter.

In 1951 I got a job as a TV director at WXEL in Cleveland and, wow, there was a mimeograph machine. Within days I had the first issue of a Teletype bulletin in the mail to everyone I knew who was involved with this obscure hobby. I called it *Amateur Radio Frontiers* and published it monthly until I took over as editor of *CQ*.

My newsletter soon got me a RTTY column in *CQ*, and that led to me becoming the editor in January 1955. Then, when I got fired in January 1960, I decided to stick with publishing. The first issue of *73* came out in October 1960.

Continued on page 82

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Continued from page 79

It was that confounded box of old radio parts that started it all. When friends found I was interested in radio they started dumping old radios on me. I had a ball taking them apart and saving the parts. If I'd only known that putting 'em up in the attic for 50 years would turn them into solid gold . . . ! But then, I'd have done a lot better job of saving my Big-Little books, my baseball cards and old marbles too. Heck, I could launch several more magazines just by selling all that old junk.

One legacy of my many years spent at the workbench building things is a twisted pelvis. I tended to stand on my right foot and this eventually gave me a slight permanent twist and a resulting weak back. I suppose it was a reasonable trade-off, because I had a wonderful time building rigs, receivers, audio amplifiers, RTTY, SSB, VHF gear and so on.

Parts? Did I have parts? I had tons of 'em. It took two moving van loads to get 'em to New Hampshire when I moved up from Brooklyn in 1962. I had thousands of tubes, cabinets full of resistors, capacitors, switches, relays, sockets, connectors. When I needed something I'd get a dozen or 50, just to be sure. I didn't just have switches or connectors, I had 33-drawer cabinets of switches and connectors.

I saw the beginning of the end when transistors and ICs appeared, so I held a couple of mammoth auctions and dumped everything at cents on the dollar, more interested in finding good homes for my parts than getting money for them. You don't sell things you love for money. I still remember every one of those parts . . . the Sangamo transmitting capacitors, the vacuum capacitors, those cute little 454 acorn and 9001 peanut tubes, remember nuvistors? How about those 815s? 826s . . . two 807s in one envelope? One rig had 203Zs, another 813s. My 2m kW had CX-125s.

Oh, there are plenty of things to build these days, but not rigs. Home building can't begin to compete with the economies of scale of commercial manufacturing. Individual hams have a hard time out-designing whole labs of engineers and technicians at ICOM, Kenwood and Yaesu.

With parts so hard to find it's easier to turn to Ramsey and other kit suppliers and let them shop Asia for us.

My first job after college was as a radio announcer/engineer. That was fun, but it didn't seem to have much of a future. I felt the same after trying television for three years. But my basic need was to get people to share the things I enjoyed, so publishing seemed like a good medium for me.

I've been at it ever since, encouraging kids to get into ham radio . . . trying to get hams to find out how much fun RTTY, SSTV, packet, 10 GHz, DXing, DXpeditioning, moonbounce, OSCAR and so on can be. Yes, I'm a nag.

When repeaters came along I drove tens of thousands of readers crazy pushing them to try 2 meter FM and repeaters. I did the same with SSB when that first came along. And computers too. I not only badgered my ham readers to try computers, I started one computer magazine after another, driving over a million readers to learn more about 'em and have fun. I published dozens of books and hundreds of software packages.

Now I'm sharing my love of music with my *Music & Audio Reviews* magazine, urging them to just dammit listen to ragtime, bluegrass, marches, folk, and a wide variety of ethnic music. And, as usual, I'm succeeding.

At 69 I have what, maybe 10 years more to go at best? Well, that's 10 years to help people have fun. And since one of the least fun things is to be poor, I also push anyone who'll read or listen to get off their butts and start making money. It's out there by the carload, just waiting for anyone with the guts to go after it . . . and that's fun too. It's exciting!

Making money doesn't take brains or even a college degree, all it takes is working in a direction which has good odds for a payoff . . . and working harder than most other people. At 69 I'm taking it easy. Heck, I seldom work more than half a day any more. Twelve hours. I can't let work eat into my hamming time, right? Hmmm, as the publisher of *73*, perhaps I should count hamming as work. No, that would put me on overtime.

Beating The Bushes

I'm heartened by the growing number of clubs which are actively trying to recruit new hams . . . particularly youngsters. My apologies for being such a nag about getting more hams. I'll be even more heartened if (a) you start sending me some photographs of your newly licensed youngsters and (b) you increase your efforts.

If your club would like to start Novice or no-code Tech classes, but you don't know how to get 'em out of the woodwork, I can give you some hints. Like hint #1 is to make sure you have interesting meetings so that when you get newcomers to come they won't be turned off forever about our hobby.

While I know it's possible that an old-timer could actually force himself to be nice to a youngster and manage at least a strained grin for a few moments, you might do better to retire your fogies to the back row and get someone with life left in 'em to front for the club. You old fogies can get mad at me if you like, since I'm probably older than you.

Okay, now how do you drum up those newcomers? Well, there are two ways to go about it, so do both of them. You can go hunting for them in the most likely places . . . on CB and in schools. It won't hurt to see if some members have kids who haven't yet been turned into fanatical ham haters.

I'd get a team of two or three club members to scout the CB channels, looking for fresh blood. If you get to 'em before they get disgusted and quit, you'll have a chance. Invite them to a club meeting. And when they come, for heavens sakes say hello to them. Talk to them. Get your members to come out of their huddle over at the side of the room and be gracious hosts. Jeeze, do I have to explain the fundamentals of good manners? Judging from many of the clubs I've visited, yes, I do.

I gave a talk about amateur radio to the fifth graders in the local school. They started a ham club and I'm still getting letters of appreciation from the kids. I wrote about that and asked if anyone had a spare rig for the club. No one wrote. Tsk. If you won't even part with a rig you're no longer using, at least put in your will to have your widow send one of your rigs to help out the kids.

If I can do it, so can you. So get in touch with your local schools and ask the principals if you can talk to the fifth or sixth graders about amateur radio. Mention that kids need to learn about technology . . . and they'll learn best if they are enthusiastic about it.

Yes, I know, that's old ground. Sure, but the fact is you haven't done it yet, so I need to remind you. When it comes to things you should be doing, but which take a little initiative, I have to nag the heck out of you. Now get moving! Heck, if I can find the time, so can you. You're *not* busier than I am.

Publicity

One of the easiest things you can do is start getting people acquainted with amateur radio by getting it mentioned in your local papers . . . and on the radio. If you know how to do this, it's simple. If you don't, you're in for a lot of frustration.

First, you need to have some sort of flimsy excuse for sending out a "release." This can be when a member of the club makes DXCC, WAS, wins a contest, when the club does Field Day, has a picnic, auction, hamfest, or other event, graduates some new licensees, holds a transmitter hunt, provides communications for a race, rally, walkathon, has a celebrity speaker (like an astronaut . . . no, I'm not a celebrity . . . of course I could immolate myself on the front lawn of the White House in protest over the loss of 40% of 220 and become a celebrity, but who needs a talk from a roast ham?).

Do some brainstorming for possible news items. How about a club member making a 10,000 mile QRP contact with a rig he can hold in the palm of his hand? Or maybe someone has made DXCC over a weekend? Or WAS in one night? Or WAC in 10 minutes? How about some contacts with hams in the USSR? Or the Mideast?

Did I ever tell you about the time I worked W7IMW/C7 in Tiensin, China? He was running 1/10th watt to a signal generator and a longwire on 10 meters! Tell me about QRP. And yes, I worked a hundred countries on a weekend, worked all states one night, and made WAC in ten minutes one morning on 20 meters. No, I didn't call the newspapers . . . but I should have!

It's unlikely the paper will send out a reporter or photographer, so you'll want to get a club member to take the pictures . . . black and white, not color, for most papers. Color pictures don't do well in black and white.

Perhaps I'm presuming too much if I suggest that you may have someone in the club who can write. Many of the letters I get are on spiral notebook paper, written in something between hieroglyphics and Sanskrit. The easier a release is for an editor to use, the more likely it is to get published. I hope that's not a revelation.

This means you appoint a literate club member to write the release. Print it out double-spaced, keeping it concise and to the point. Include the floppy disk so the editor won't have to re-keyboard it. The less editing it needs, the more likely it is to see print. Tell the story simply and clearly. Leave out the ham lingo. Try to work in how much fun everyone had at whatever you're writing about and give a contact name and phone number, both for the editor and for any readers wanting information about club meetings.

Once you have your release ready to go, complete with some photos (each with a caption taped to the back . . . do not use a ball pen), it's time to call the editor and tell him you're sending a release. Tell him if he has any questions to give you a call.

Then, when you think he's had time to get the release, call again and see if he has any questions. You can then ask if he's going to run the story, so you can tell the club members and their families to look for it.

Be sure to include the fact that the club is giving license classes and that newcomers are most welcome. Then see that they are.

One more thing, try to get across the idea that you're having fun.

If you keep getting our hobby into print and mentioned on the radio, eventually the concept that hamming is fun and accessible will seep into the public consciousness. With over 3,000 ad messages a day hitting us, it isn't easy to get through the clutter. It takes imagination and persistence. One time doesn't do a thing. Two times doesn't either. It takes a continuous barrage to penetrate.

When I lecture college students on entrepreneurialism I always ask for a show of hands of those who know what amateur radio is. I'd say that about 5% of them even have a clue. And it's our fault that we have an almost totally secret hobby.

One of the things I pleaded with you ARRL members to do is to lean on those old dodo directors you keep electing every two years and get them to have the general manager set up an honest-to-goodness PR department to go after both national and regional publicity for the hobby. And keep leaning until they stop double-talking and get into action.

Okay, you have your marching orders, what else do you need? Let's get cracking . . . and don't forget to send me a copy of your stories when published so I can start giving your club credit. 73

Say you saw it in 73!

HAMS WITH CLASS

Carole Perry WB2MGP
P.O. Box 131646
Staten Island NY 10313-0006

The Berens River Connection

As a ham radio operator, I am always fascinated with the way every radio contact can produce its own unique fun, excitement, or information. As a teacher using ham radio in the classroom, I continue to be impressed with the myriad of spin-off lessons that can be generated from the simplest of radio contacts.

Without even realizing it most of the time, hams are always demonstrating skills other than radio expertise. Determination, diplomacy, good will, cooperativeness, and helpfulness are but a few of the very real observable traits most hams convey to the world 24 hours a day. How wonderful it is to be able to point this out to children who are at the radio.

When Bill Peckham VE4AAL, principal of the Berens River School in Manitoba, contacted me, neither one of us could have predicted the excellent exchanges our schools would be involved with. Bill and his students tried to check into our CQ All Schools net for months. We always called for them, knowing that they would be there listening for us. When we finally did make contact, it was especially meaningful to all the youngsters. Phrases like "ham determination" and "never say die" were heard in my classroom for days as the children discussed the contact.

The children, being natural goodwill ambassadors, quickly set up a pen-pal exchange with their counterparts in Canada. Many class sessions in the next few months were spent on producing a schoolwide video to send to Bill and his students. We continued to be surprised and amazed at the differences in our respective schools. When my students in Staten Island learned that Berens River had a total population of 1800 people, their jaws literally dropped. The school population in our 6th, 7th, and 8th grade intermediate school alone is 1800. It was great fun for me to watch the expressions on their faces when they heard these facts on the radio. The video tape and letter exchange will undoubtedly be remembered for a long time. If you are lucky enough to be an instructor with a ham radio in your classroom, don't cheat yourself and your students out of this kind of terrific learning experience.

From VE4AAL: Report on Student Ham Radio

Berens River is an isolated community located 180 miles directly north of Winnipeg, Manitoba's capital city. The community is accessible by road only during January to March, when vehicles can drive over the frozen lakes, rivers, and muskeg. During the summer, Lake Winnipeg offers passage for barges and fishing boats. Excellent airport facilities allow small commercial airlines to fly in and out on most days. Isolation is a factor shared by many northern Manitoba communities.

Berens River First Nation Reserve has approximately 1800 residents, most of whom are Treaty Indians of the Saulteaux Tribe. Many of the students speak Saulteaux fluently, and have the opportunity to study their language at school. School programs encourage respect for their local heritage and culture.

Berens River School is operated by Frontier School Division No. 48, and costs are shared with the local Native Band. Frontier School Division is the largest school division in total area, in North America, and covers many remote communities. The Area 3 superintendent has been most supportive in encouraging new programs, like the Ham Radio Pilot project, which will hopefully help advance communications in these northern communities. Student interest could develop into lifelong hobbies, and perhaps lead into various careers. Many students have been introduced to radios because their parents operate marine radios on their fishing boats in summer when the boats head out on Lake Winnipeg. During winter, when the fishermen use bombardiers on the frozen lake, marine radios are essential equipment.

In the fall of 1990, the ham radio shack in Berens River School received a new rotor and control for its large-sized, heavy beam antenna. The Berens River Band Council gave the school a large steel tower on which to mount the beam. This antenna allows global coverage of the 10, 15, and 20 meter bands. Another antenna, an inverted-vee, allows contact on the 40 and 80 meter bands. The ICOM 735 transceiver provides state-of-the-art radio contact with the outside world. The ham radio pilot project in our school includes classes in grades 5, 6, and 7. This program has been slow at getting off the ground, but more volunteer students are getting involved from these three classes. Morse code keys have been received to practice code so the students are well on their way toward learning the alphabet. The students often meet during regular class time and have been spending more time during lunch hours and after school.

The highlight of our ham radio program thus far has been the 6th and 7th grade students' recent contact with Carole Perry's students in Staten Island, New York. We had often tried to connect with them last year, but without success. For most of our students, it was the first time they had spoken into the mike. By the time we made our second clear (5/9) contact, the students were able to give their names

Photo A. Berens River School Principal Bill Peckham VE4AAL at the school rig.

Photo B. Fifth grade students watch as Kingsley McDonald speaks on the radio.

Photo C. Eighth grade students Farah Berens (at the mike) and Arnold Disbrowe learn how to make QSOs.

phonetically over the mike, and were quite excited with the matching of pen pals. Some students were apprehensive about their poor writing skills, but were reassured that they would receive extra help with letter writing. They were willing to try, and have nearly completed their rough drafts. We've received our first pictures of Carole's students, and have Polaroid pictures of our own students in the mail.

The students are eager to learn more about New York City, our contact area. They weren't too sympathetic with Carole when she mentioned the snow storms in New York, as we had experienced blizzards with −40 degrees Celsius during the holidays. The wind chill sometimes made it more like −50 degrees. Students in Hollywood, California, talking on Carole's net during our first contact certainly couldn't comprehend these conditions.

Dave Place, a guest instructor, recently visited our school while in our community on business. He explained to the students the theory of how messages are transmitted from the radio through the atmosphere to other locations. Within minutes, Dave had several students talking to people in England and Wales, as well as listening to people in Italy. What a way to integrate studies! It is most encouraging to hear students who have never had much academic success spell their names phonetically on the radio, and do their best writing a letter to a new pen pal!

Our next challenge is to have our 5th grade students talk with Larry, a teacher in Hawaii I made contact with several times last June, and his students. Through such contacts, our students are beginning to understand the concept of time zone differences.

My latest challenge to the students is the offer of a free ham station to the first student who passes his or her Novice ham exam. One young lady asked me what I would do if several students passed the exam at the same time. Do they each get a station? I hadn't thought about that!

In the future, we will have to address several needs. First, we need to identify and obtain learning materials (books, publications, Apple IIe computer disks, and video tapes) suitable for our students, to help prepare them for their Novice ham radio exams. Second, we need more instructors, as the increased interest among other students means an added strain on the instructor's time.

Considering the advantages and educational benefits to the children of the Ham Radio Project, the time, money, and effort makes everything worthwhile. 73

All hams are encouraged to use this column as a focus and reference, and to send in suggestions and ideas so that we can share and network with each other on ways to promote amateur radio to capture the interest of people of all ages.

Number 23 on your Feedback card

UPDATES

Pseudo CW Filter

See the above article in the June 1991 issue, page 18. Several pinout numbers in the original schematic need to be changed to reflect the PC board pattern: pinouts 4, 5, and 6 should be 10, 9, and 8, respectively on U3. See the Figure for the corrected schematic.

Although the CW filter will work with the incorrect pinouts above, it will not work without the junction of C8 and C9 going to ground. Note the ground in this new schematic. Note, however, that the PC board layout is correct. TNX John Korzenko KB5JOZ for calling this to our attention.

Poor Man's Packet

See this article in the August 1991 on page 8. Wm. Kresl WB9BBC writes that he and Jim N9EDX have discovered an easier method of aligning the modem RX BIAS adjustment. The procedure is as follows:

1. Disconnect the 33 ohm load resistor (R6) from the RX audio input line.

2. Temporarily jumper the TX audio output line to the RX input line.

3. Enter the PMPTEST software and run the 600 Hz transmit audio test.

4. Place a scope on the RXD data line of the modem chip (pin 8). The transmit data consists of perfectly timed square waves (duty cycle wise).

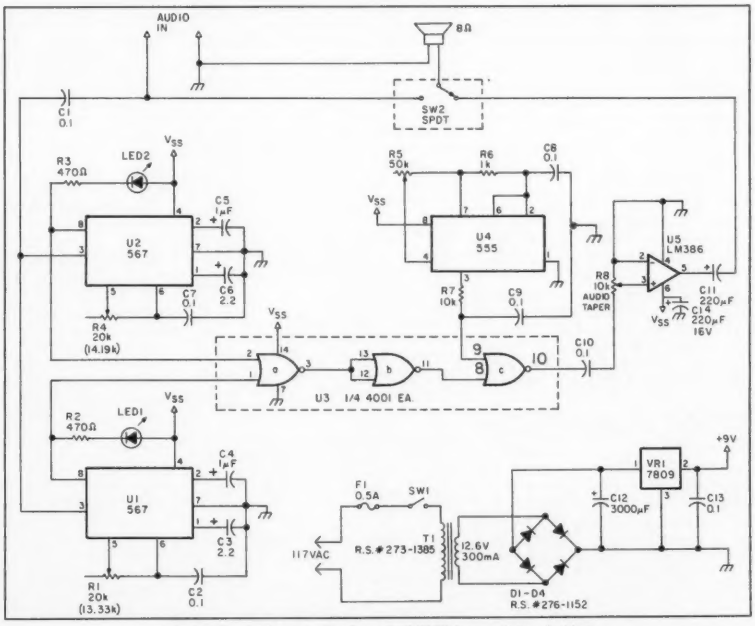

Figure. Corrections for the Pseudo CW Filter are shown in blue.

5. Adjust the RX bias pot (R1) for perfect 50% HI and 50% LOW duty cycle pulses. This is a critical adjustment made simpler with the scope.

6. After adjustment, re-connect the RX load resistor (R6) and remove the temporary jumper.

Says WB9BBC, "I also used a scope to set the TX audio output modulation to the HT to approximately 20–50 mV (peak-to-peak). I have built and tuned up five modem boards since, and the procedure works fine." TNX Wm. Kresl WB9BBC. 73

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Notes from FN42

I am writing this during the last week in August. As we all probably remember, there was an attempted coup in the Soviet Union to remove Mikhail Gorbachev from the Presidency of the Soviet Union. As usual with world events, hams were involved in the happenings.

In the United States we were shown video footage on the television of what was happening in Moscow. One of the stories showed the office of Boris Yeltsin, President of the Republic of Russia. A portion of the report showed that an ICOM IC-735 was being used for communications on 14.167 MHz, a ham allotted frequency. [Editor's note: We just received a newspaper clipping from *The Morning Call*, an Easton, Pennsylvania, publication, on amateur radio operator Romeo Stepanenko 3W3RR, a resident of Moscow who kept Yeltsin in touch with the world during the three-day seige. In a FAX to William N. Goodman K3ANS, at whose home Stepanenko was a guest last year, Stepanenko writes, "Listen to R3A on 14.175 and 7.044, the only real and trusty information." Yuri Brajenko, who helped set up the shortwave station, said that the station also collected and retransmitted information from other parts of the country on the people's reaction to the attempted takeover. Helen Brajenko translated Russian to English on the air for Stepanenko. Yuri, Helen, and Stepanenko spent three days and three nights with a team of Russian ham radio operators on the sixth floor of the Russian Parliament building, keeping the world informed. TNX K3ANS for sending us this information.]

About the same time, the eastern seacoast was visited by Hurricane Bob. Usually a hurricane that could cause heavy damage would receive top billing in the media, but it came in second to the attempted coup in the Soviet Union.

A week following the hurricane, I was watching a program on one of our PBS (Public Broadcast Service) TV channels which showed the effects of hurricanes and what can be done by business owners and homeowners to minimize the damage from the winds and rain. In the program, a weather forecaster asked for more information from an affected area. He was talking to a person sitting in front of a radio. The readout on the front of the radio showed 14.325 MHz, a ham frequency in the United States.

I have listened to that frequency in the past during hurricanes and have heard the National Weather Service (NWS) in Miami, Florida, receiving reports from hams on conditions there. That information was very important because the data from the NWS in the affected area was unavailable due to a power outage.

Sometimes I have heard the reverse; the NWS has sent warnings to the affected areas by ham radio because all other communications channels were out due to weather related damage.

This points out that hams have been useful in many different ways in the past, and must be ready to assist at any time when the need arises. Now is the time to prepare for the future.—Arnie N1BAC.

Roundup

Japan From *The JARL News*: The International Telecommunications Union (ITU) has decided that a Plenipotentiary Conference will be held in Kyoto, Japan, for five weeks, commencing September 19, 1994. This is the first time that the ITU Plenipotentiary Conference will be held in the Asia-Pacific region, and more than 1,200 participants, originating from as many as 164 countries, are expected to attend.

Though the agenda for Japan has not yet been decided, a special plenipotentiary committee will hand over the subject of ITU reorganization, and the new direction of ITU will be discussed. Equally of importance will be the election of a new secretary general.

Taiwan Official Visits JARL. Mrs. Tsai S. Luan, a senior member of the Telecommunications Bureau of Taiwan, together with her husband, visited JARL's offices and met with the Secretary of the IARU, Region III, Mr. Fujioka, and the latter explained in general about amateur radio in Japan, and elaborated on JARL's various activities as well.

Their two-day visit (June 18 and 19) was, according to Mrs. Luan, very satisfying as she was given full details to her inquires about the Japanese system of qualifying amateur radio operators and licensing.

AUSTRALIA

David Horsfall VK2KFU
P.O. Box 257
Wahroonga NSW 2076
Australia

This is just a quick preview of the coming months. Briefly, there is agitation to remove the CW requirement completely for HF access, and replace it with further theory (e.g., advanced communications); and following the development of examinations to accredited examiners, the WIA looks to be the sole supplier of such papers, thereby putting a few noses out of joint. Finally, the packet protocol wars are raging again. This time it's ROSE vs. NET/ROM. Stay tuned for the latest!

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Israel
Packet: 4X1MK@4X4SV.ISR.EU

Ministry of Communications News Speaking for the Ministry of Communications at the annual General Membership Assembly of the IARC, Mr. Alon Bar Sela 4X1AB praised the radio amateurs who came forward and volunteered their services at the Ministry's monitoring station in Jaffa, as well as those who relayed traffic for the American servicemen and women stationed in the Persian Gulf during the crisis and war.

Alon assured us that the Israeli delegation to the 1992 World Administrative Radio Council (WARC) will be a staunch supporter of amateur radio, and will do its best to defend our bands against the various interests who wish to take more slices of spectrum away from us.

The Ministry of Communications caught some pirates who had been causing interference to amateur communications, and seized their equipment and filed criminal charges with the police. Mr. Bar Sela stressed that it is difficult to catch such culprits, and even once things are before the courts it can take much time before sentences are passed. Nonetheless, being caught and having equipment seized is an unpleasant experience and a punishment in itself, as well as a deterrent to others. The Ministry would like to see more participation from the amateur community in this ongoing hunt.

4X1AB cited the opening of a portion of the 50 MHz band for radio amateurs in Israel, and said that this was a step in the direction of further increasing amateur activity here in that frequency range. In closing he congratulated the young amateurs who had just recently passed the Novice examinations, and said that with the expansion of Novice privileges we were seeing a greater influx of young people into our ranks.

Activity Thrives at the IARC Home Every Thursday evening the new IARC headquarters are bustling! Each week at this time interesting lectures are delivered mainly, but not exclusively, on topics related to amateur radio. Topics covered up to now include computer programs, packet radio, antenna tower construction and safety, electromagnetic radiation, and aircraft accident analysis.

Behind the scenes, organizing these different interesting talks, is Tuvia Greengross 4X4GT. It is said that Tuvia is an expert in arm-twisting, convincing members of our ham community, which it turns out is blessed with numerous experts in many fields, to give an evening's talk on the subject of their expertise.

Morse Camp in Haifa! For the first time in the history of Israel, a day camp is being held for the express purpose of teaching Morse code. From July 7th through the 18th, from 8 a.m. to noon, the course, sponsored by the City of Haifa, is being held at Beit Miller on

Continued on page 90

Photo. The President of the Govierno Autonomo, Don Lorenzo Olarte Cullen (seated), is shown with the president of the URL Club.

Number 26 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603–525–4438) for listings that were too late to get into publication.

NOV 2

ENID, OK The Enid ARC will host a Hamfest at Garfield County Fairgrounds' Hoover Bldg., Oxford St. and N. 4th. VE Exams begin at 10 AM, walk-ins welcome. Free parking, free table spaces. Dealer present. RV hook-ups. Admission $1. Talk-in: 145.29/144.69, 444.40/449.40. Contact ***Tom N5LWT, (405) 233–8473, eves.***

NOV 3

WESTMINSTER, MD The 2nd Annual Mason-Dixon Computer and Hamfest will be held at the Carroll County AG Center, Smith Ave. Limited overnight camping sites are available. Set-up begins at 6 AM, gates open at 8 AM. Admission $5. Tailgating $5. Inside tables $10. VE Exams. Contact ***Dennis Baldwin KA3IXG, (301) 239–3878***, or write ***PO Box 2099, Westminster MD 21158.***

NOV 8

CAMILLUS, NY VE Exams will be held at the Town of Camillus Municipal Bldg., 4600 W. Genesee St., starting at 7 PM. Test fee for Technician through Extra class is $5.25. Talk-in: 147.300. Contact ***John Patchett KB2ERJ, (315) 487–0298.*** Please bring two forms of ID and a copy of your license.

NOV 8–10

CHIANG MAI, THAILAND The Radio Amateur Society of Thailand will host the 19th annual SEANET Convention at the Chiang Mai Plaza Hotel. For reservation details write to ***G.P.O Box 2008, Bangkok 10501, Thailand,*** or check into the net from 12:00 Z on 14.320 and contact any **HS** station that checks in.

NOV 9

COOKEVILLE, TN An indoor Hamfest will be held by JVARN from 7 AM–3 PM. Set-up at 5:20 AM. Admission $2, tables $5. Location given on talk-in on 145.45 RPT. Contact ***Bill Ferrell N4SSB, (615) 452–3962.***

NOV 10

LONG ISLAND, NY The Radio Central ARC will sponsor HAMEXPO at Suffolk County Community College, Long Island Expwy. exit 62–Nichols Rd./County Rd. 97–1 mi. north. Free parking. VE Exams, seminars, forums. Admission $5 at the door. Tables $20 in advance. Send to ***Radio Central ARC, PO Box 680, Miller Place NY 11764.*** For info call ***John Mark KB2QQ, (516) 689–6336*** or ***Jo Ann Coletti N2IME, (516) 399–1877.***

NORTH HAVEN, CT The South Central Connecticut ARA will hold an indoor Ham Radio and Computer Flea Market at North Haven Park and Rec. Center, 7 Linsley St. Sellers admitted at 7 AM, buyers 9 AM–3 PM. Tables $15 in advance, $20 at the door. General admission $3 per person. Talk-in: 146.01/.61. Table reservations must be received with check by Nov. 1st, no reservations by phone. For reservations and info, SASE to ***SCARA Flea Market, PO Box 81, North Haven CT 06473,*** or call ***Brad WA1TAS, (203) 265–6478*** between 7 PM and 10 PM.

NOV 16

PLYMOUTH, MA The Mayflower ARC will host a Flea Market at the Plymouth Memorial Hall Bldg. in Plymouth Center (RT3A) from 9 AM–4 PM. Tables are $10 in advance, $12 at the door (if available). Sellers admitted at 8 AM. Donation $2, children under 12 free. There will be a Microwave/ATV demo. Talk-in: 446.625 and 146.55 simplex. Mail SASE and check with table payments to ***M.A.R.C., PO Box 766, Plymouth MA 02360.*** For info call ***Jon WS1K, (508) 746–0162*** or ***Jim NM1F, (508) 747–2224***, eves.

MONTGOMERY, AL The Montgomery ARC will host the 14th annual Montgomery Hamfest in Garrett Coliseum at the South Alabama State Fairgrounds on Federal Dr. Free parking. Free admission. Set-up begins at 6 AM; doors open to the public from 8 AM–3 PM. FCC Exams start at 8 AM. Bring original and a copy of your current license, picture ID and $3. Talk-in on 146.24/.84, call W4AP. Ragchew 146.32/.92 (with phone patch, •up/#down), 147.78/.18, 449.50/444.50. Flea Market reservations are not required. Special Hamfest rates at Villagers Inn, I-85 at Ann Street ($28.50 plus tax, up to 4 folks). Phone the desk at ***(205) 834–4055*** or ***800–328–7829.*** For reservations at the Coliseum Motel, across the street from the Hamfest, the desk phone is ***(205) 265–0586*** or ***800–876–6835.*** For more info write to ***Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery AL 36116*** or phone ***Phil, (205) 272–7980*** (after 5 PM CST, or any reasonable hour on weekends and holidays).

NOV 17

CHICAGO, IL The Ham Auction of the Chicago ARC will be held at the DeVry Inst. of Tech., 3300 N. Campbell, from 12 Noon untill all is sold. Door opens at 11 AM for sellers.

NOV 23

BILLERICA, MA An Amateur Radio and Electronics Auction will be held from 11 AM–4 PM at 300 Concord Rd. Free admission and parking. Seller check-in at 9:30 AM. Buyers admitted at 10 AM. Commission is 15 percent, $1 minimum, $30 maximum. No commission for owner buy-back. Contact ***Eliot Mayer W1MJ, (508) 851–0183.*** This event is sponsored by Bull HN 1200 RC and the Waltham ARA.

NOV 24

WHEATON, IL GMRS of Illinois, Inc., will hold our annual "Winterfest" at DuPage Co. Fairgrounds on November 24, 1991, from 8:00 a.m. to 1:00 p.m. Tables are $10 in advance, $12 at the door. Tickets are $4 in advance and $5 at the door, outdoor flea market spaces are available at no charge. Plenty of parking, no tables in hallways, no crowding. For more info call ***Bob (708) 690–1492*** or write: ***GMRS of IL, Inc., 2077 W. Roosevelt Rd., Wheaton IL 60187.***

RICHMOND, VA PC Fest Computer Shows, Inc. will hold a Hamfest at the Virginia State Fairgrounds from 10 AM–4 PM. Admission is $6 for adults, children under 10 admitted free.

NOV 30

APACHE JUNCTION, AZ The Superstition ARC, WB7TJD, will hold its annual Hamfest at P&M Rodeo Grounds, NW corner Brown Rd. and Meridian, from 7 AM–3 PM. Admission $1. Tailgate space $3 per space. overnight parking, no hook-ups. Talk-in: 147.72/.12. Contact ***Chuck Kruppenbacher, (602) 986–3060.***

SPECIAL EVENT STATIONS

NOV 2

URBANNA, VA The Rappahannock ARA will operate K3RZR, 1330–2130 UTC, to celebrate the 34th annual Urbanna Oyster Festival. Operation will be in the following bands: 20 meters: 14.140/.280; 40 meters: 7.240/.280; 80 meters: 3.860/.880. For certificate, send QSL and 8½ x 11 SASE to ***Phyllis Haxton N4VZC, PO Box 396, Burgess VA 22432.***

NOV 2–3

COOKEVILLE, TN The ARS of Tennessee Technological University, will operate Station WA4UCE from 1400–2400Z Sat. & Sun., in conjunction with the University's 46th Homecoming Celebration. Operations will be on the General portions of the 80, 40, 20, 15 and 10 meter bands and the Novice portion of 10 meters. For certificate, send QSL and 9 x 12 SASE to ***TTARS, Tennessee Technological University, Box 5262, Cookeville TN 38505.***

CHARLOTTE, NC The new Amateur Radio Education Center at the Discovery Place Science Museum will celebrate its opening by hosting Station W4BFB from noon EST Nov. 2–noon Nov. 3. W4BFB will be operated by the Mecklenburg ARS, primarily on phone in the bottom 50 kHz of the General phone subbands on 75, 40 and 20 meters, and around 28,400. For QSL and Certificate, send QSL card and a 9 x 12 SASE with two units of First Class postage to ***Ralph Eubanks KK4FC, 6021 Coatbridge Lane, Charlotte NC 28212, USA.***

NOV 3

LEGARTO, TX To help celebrate the medieval flavored AbbeyFest I, the Benedictine monastery of Corpus Christi Abbey and Benedictine Retreat Center, the Corpus Christi ARC, will operate station W5MS near the shore of Lake Corpus Christi, in Live Oak County, from 0000–2359 Z. Frequencies: Lower 25 kc phone subbands of the 84, 40, 20, 15, and 10 meter bands; RTTY on 20 and 15 m; 146.96–, 147.08+, 444.70+. For a QSL certificate, send QSL and a large SASE to ***Br. Dominic Mazoch, OSB, N5TCB, HCR 2 Box 6300, Sandia TX 78383.***

NOV 4–10

PENSACOLA, FL The Serious Hams ARC will operate 4 Nov.–10 Nov. to celebrate the decommissioning of the USS Lexington AVT-16. Operations will be in the lower portion of the General 80–15 meter subbands and 28.350. For certificate, send QSL and a 9 x 12 SASE to ***Mike Brown N4MAD, 519 S. Edgewood Cir., Pensacola FL 32506.***

NOV 7

CLINTON, NC The Sampson County ARS will operate Station AB4TT from 1700–2400Z for the Sampson County Expo and Pork Festival. Operation will be in the lower portion of the General bands. For certificate, send QSL and SASE to ***SCARS, PO Box 64, Clinton NC 28328.***

NOV 9

MEMPHIS, TN The Delta ARC will operate W4BS from 1400–0000Z in celebration of the grand opening of the Pyramid on the Mississippi. Look for operation at 14.305, 21.320, 28.455. For a nice, full color QSL, send SASE to ***Delta ARC, PO Box 16343, Memphis TN 38186-0343.***

Continued from page 88

Shoshanat HaCarmel Street, home of the 4X4HF radio club. Intended for youths, the fee is a mere 105 shekels (US$45).

Those diligently participating for the fortnight, even with no previous knowledge of the code, should gain at least enough proficiency to pass the Novice ham test. A fully-equipped ham station is on the premises, and part of the time will be devoted to operating procedures. We hope to get a follow-up this fall, when the Ministry of Communications exams will be held. Will this project yield a crop of new young hams?

SPAIN

Woodson Gannaway EA8/N5KVB
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de Gran Canaria)
Islas Canarias
Espana

Ham Party. Any party among Hispanics is an excuse to get together and have a good time! Early in my stay here a friend was telling me about an upcoming party, and I made the mistake of asking him what time it would be. He replied, "To have a party here you don't need a specific time, only a day."

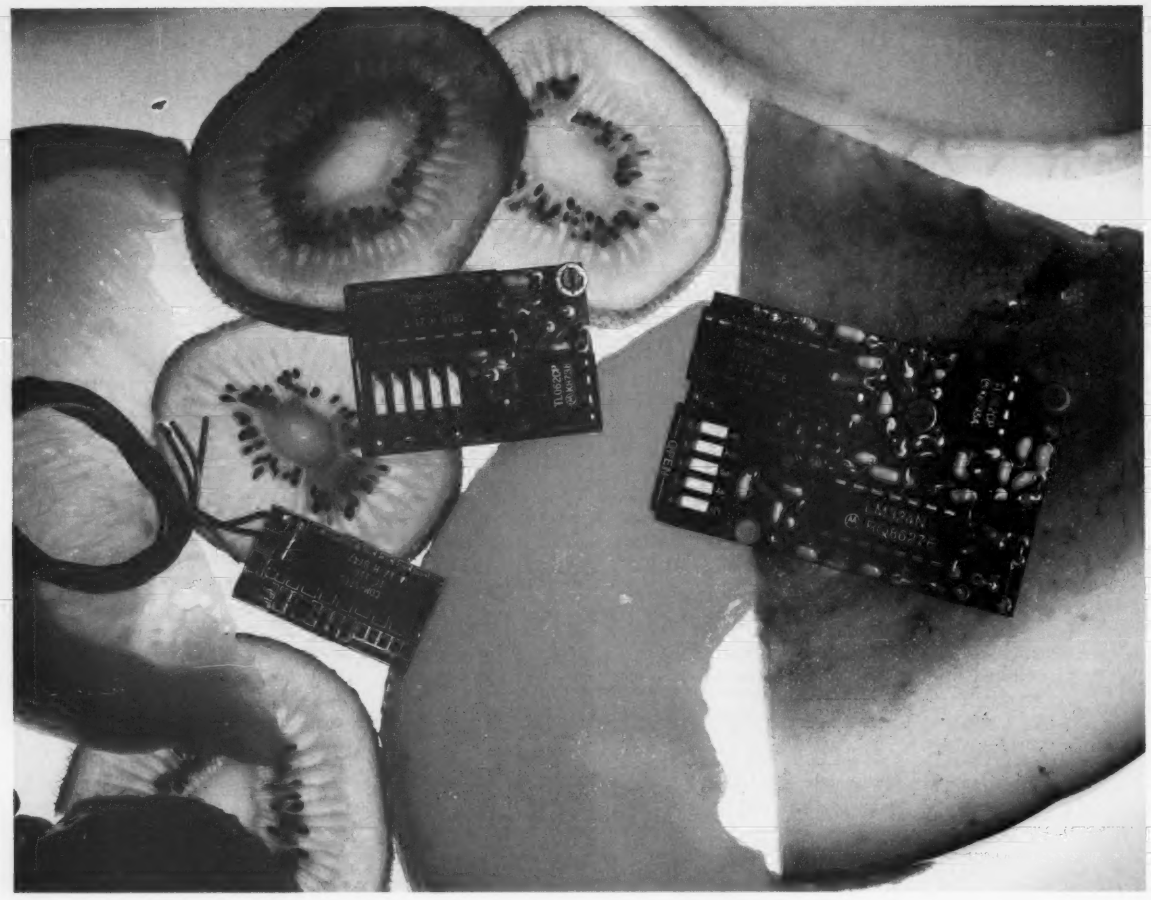
One purpose of a recent party was to award five insignia to stalwart members of the ham club. The requirements were: to have been a member of the club at least 15 years, and to be at least 65 years old. Another purpose was to award the "Diploma Islas Canarias" to all the EA8 ops who have earned it; fulfilling the requirements are much more difficult for EA8s than for hams in other parts of the world.

Plaques were also awarded to several collaborators and the president in appreciation for their many services to the URL. Several foreigners, such as YL (XYL?) CO5CB, a Cuban, received plaques as reminders of their stay among us.

Furthermore, an unusual note of thanks was given by the YL members of the URL to one of their members of whom they are very proud for her awards and achievements during the short time she has been participating in the contest world. In addition to some pretty amazing individual feats, she led the URL "contest team" to several world championships. Those of you who read this column may know that we can be talking of none other than Elsa EA8BVH. And so her YL companions awarded her a keepsake plaque.

Another reason for the party was to celebrate the formal reopening of the club after extensive remodeling of the building and grounds. This was attended by officials of the state government, as shown in the photo. The party was a great success with lots of good and lively music until the wee hours of the morning, but without the fireworks like we have on Independence Day in the United States (O.K., Luisa?). In all, a memorable night of April 27.

Oh yes, my call now is EA8/N5KVB, which is the uniform style in the Common Market countries for temporary licensees. I'm still in that category. Until next time, 73. 73



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PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 E. Chateau Circle
Payson AZ 85541

The November Blahs

As most of you know, the spring and fall months of the year, centered around the mid-March and mid-September equinoxes, are traditionally the best times for DX propagation. However, as the months progress toward the solstices of December and June, conditions gradually deteriorate on the long-distance HF hauls.

November is one of those in-between months, yet a time for contesting, too. What can we say about this November? Well, among others things, YY—EEE—CCC—HHHH and Blah, with a capital "B." That's a bit of an exaggeration, but I really don't see a lot of good days for HF band propagation.

The poorest conditions will be centered around the 8th of the month, and again around the 25th. The rest of the month will exhibit fair conditions, with occasional good days, as shown on the calendar, around the 18th through the 22nd...possibly five days in all.

But, On Other Bands...

What's sauce for the goose is not necessarily sauce for the gander, and I expect that the bands between 30 and 160 will be quite reasonable for night-time DX, and grayline (along the path of dawn and sunset) propagation will provide some excellent contacts.

The bands between 30 and 10 meters, will not be "too shiny," as a local friend of mine says. Of course, these are just guesses based on some pretty advanced crystal gazing, and I hope my pessimistic prognostications are wrong by a mile or more. Certainly, for the past six or eight months, Old Sol has confounded the experts and created some unusual propagation conditions. There is no reason to believe that that will change soon, so be aware that anything can happen, and possibly will...from great to rotten!

Feedback Wanted

On the poor ("P" on the calendar) days, we may experience anything from radio blackout to difficult-to-read signals on the HF bands with loads of QSB. Perhaps some of the lower HF bands won't be as greatly affected. Characteristically, the signals on poor days will not have the sock they have on good days. On the days marked fair ("F" on the calendar), you can expect some good DX contacts between selected areas, but not everywhere. I wish it were not so, but that's the way it looks. I hope that some of you will call or write and tell me how wrong I was.

WWV at 18 minutes after the hour can be your guide to "conditions for the next 24 hours," but you'll find that even they don't always hit the mark. Look for low Boulder A (below 10) and Boulder K (below 3) and high Solar Flux (about 200) for your best chances. Let me know how it works out for you!

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	—	—	—	—	20	20	—	—	—	—	15(17) 17
ARGENTINA	15(17) 17	20	20	—	—	—	—	—	—	15(17) 17	15(17) 17	15(17) 17
AUSTRALIA	15(17) 17	—	20	20	—	20/15	20	—	—	—	—	—
CANAL ZONE	20	20	20	20	20	20	20	15(17) 17	15(17) 17	15(17) 17	15(17) 17	15(17) 17
ENGLAND	20	20	20/15	—	—	—	—	15(17) 17	15(17) 17	—	15(17) 17	20
HAWAII	15(17) 17	15(17) 17	20	20	20	20	20	—	—	—	—	15(17) 17
INDIA	20"	20"	—	20"	20"	—	—	—	—	—	—	15(17) 17
JAPAN	—	—	—	—	—	20	20	—	—	—	—	15(17) 17
MEXICO	20	20	20	20	20	20	20	15(17) 17	15(17) 17	15(17) 17	15(17) 17	15(17) 17
PHILIPPINES	—	—	20	—	—	20"	20"	15(17) 17	15(17) 17	—	—	—
PUERTO RICO	20	20	20	20	20	20	20	15(17) 17	15(17) 17	15(17) 17	15(17) 17	15(17) 17
SOUTH AFRICA	—	40"	20	20	20	—	—	15(17) 17	15(17) 17	20	—	—
U.S.S.R.	20	20/15	20/15	—	—	—	—	—	—	15(17) 17	15(17) 17	20
WEST COAST	15(17) 17	15(17) 17	40/15	40/15	40	40	40	—	20	15(17) 17	15(17) 17	15(17) 17

CENTRAL UNITED STATES TO:

ALASKA	15(17) 17	—	—	—	—	20	20	20	—	—	—	15(17) 17
ARGENTINA	15(17) 17	15(17) 17	20	—	—	20"	—	—	—	—	15(17) 17	15(17) 17
AUSTRALIA	15(17) 17	15(17) 17	—	20	20	—	20	—	—	—	15(17) 17	15(17) 17
CANAL ZONE	15(17) 17	20	20	20	—	20	20	15(17) 17	15(17) 17	15(17) 17	15(17) 17	15(17) 17
ENGLAND	20	20	—	—	—	20"	—	—	—	—	15(17) 17	15(17) 17
HAWAII	—	—	20	20	20/15	—	20	—	15(17) 17	15(17) 17	15(17) 17	15(17) 17
INDIA	15(17) 17	20"	—	—	—	20"	20"	—	—	—	—	15(17) 17
JAPAN	15(17) 17	—	—	—	—	20	20	20	—	—	—	15(17) 17
MEXICO	15(17) 17	20	20	20	—	20	20	15(17) 17	15(17) 17	15(17) 17	15(17) 17	15(17) 17
PHILIPPINES	15(17) 17	—	20"	—	—	—	20"	20"	—	—	—	—
PUERTO RICO	15(17) 17	20	20	20	—	20	20	20	15(17) 17	15(17) 17	15(17) 17	15(17) 17
SOUTH AFRICA	—	—	20/15	20"	—	—	—	15(17) 17	15(17) 17	20"	—	—
U.S.S.R.	20	20	20	20	—	20"	—	—	15(17) 17	15(17) 17	15(17) 17	20

WESTERN UNITED STATES TO:

ALASKA	15(17) 17	20	20	20	20	20	—	20	15(17) 17	15(17) 17	15(17) 17	15(17) 17
ARGENTINA	15(17) 17	15(17) 17	15(17) 17	20	20	—	—	—	—	—	15(17) 17	15(17) 17
AUSTRALIA	15(17) 17	15(17) 17	15(17) 17	20	20	20/15	20/15	20	—	—	—	15(17) 17
CANAL ZONE	15(17) 17	15(17) 17	20	20	20	—	—	—	—	15(17) 17	15(17) 17	15(17) 17
ENGLAND	20	20	20	20	—	20"	—	15(17) 17	15(17) 17	—	—	20
HAWAII	15(17) 17	15(17) 17	20	20	40	40	20	20	—	15(17) 17	15(17) 17	15(17) 17
INDIA	—	15(17) 17	15(17) 17	—	—	—	20"	20"	15(17) 17	15(17) 17	—	—
JAPAN	15(17) 17	20	20	20	20	20	—	20	15(17) 17	15(17) 17	15(17) 17	15(17) 17
MEXICO	15(17) 17	15(17) 17	20	20	20	—	—	—	15(17) 17	15(17) 17	15(17) 17	15(17) 17
PHILIPPINES	—	15(17) 17	15(17) 17	—	—	20	20	20	15(17) 17	—	—	—
PUERTO RICO	15(17) 17	15(17) 17	20	20	20	—	—	—	—	15(17) 17	15(17) 17	15(17) 17
SOUTH AFRICA	—	—	—	20"	—	—	—	20"	15(17) 17	15(17) 17	—	—
U.S.S.R.	20	20"	20"	20"	—	—	—	—	—	—	—	20
EAST COAST	15(17) 17	15(17) 17	40/15	40/15	40	40	40	—	20	15(17) 17	15(17) 17	15(17) 17

Notes: (1) Possible but rare dual bands (10 or 12, 15 or 17, 20 or 40). Try where shown. The highest possible bands shown. Also try next lower band at times shown.

NOVEMBER 1991

SUN	MON	TUE	WED	THU	FRI	SAT
					1 P-F	2 F
3 F	4 F	5 F	6 F-P	7 P	8 P	9 P
10 P-F	11 F	12 F	13 F	14 F-P	15 F-P	16 F-P
17 F-P	18 F	19 F-G	20 G	21 G	22 G-F	23 F-P
24 P	25 P	26 P	27 P-F	28 F-P	29 P	30 P

Number 29 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

State of the Shack

Since moving out on my own, I've had what could be called a "shack" in three separate locations. One was a corner of the bedroom in a tiny apartment in Hamden, Connecticut. The next was in a basement room in Weare, New Hampshire, and the latest (and best) is in a ground floor room in my home in Hillsboro, New Hampshire. With each location, the possibilities for my shack have become better and better—more room, more isolation from household and radio interference, better antenna possibilities, less chance of causing TVI. So, how come my shack always looks like a garage sale?

Actually, comparing my shack to a garage sale is doing a disservice to garage sales. My shack is usually much worse.

Since my shack also serves as my home office as well as my home recording studio (4 tracks of analog and 8 tracks of digital), I suppose I should cut myself a little slack. Still, I must be honest and admit that it's not the amount of equipment. If it were all arranged in an organized manner, it would all be usable AND neat. Most of the stuff in my shack is neither.

Desk #1 holds my basic HF and packet stations. Nothing fancy, just a modern HF transceiver, antenna tuner, an HT and 30 watt amp, multimode controller, computer and monitor, plus a telephone, microphones and other accessories. Since I test a lot of ham gear for *73*, I usually have at least one extra HF transceiver set up in a temporary position. This means that my Drake TR-4 must give up its place on desk #2 and is relegated to the floor next to desk #1 (behind the closet door, next to the spare microphone stands). Also on desk #2 you will find at least one 2 meter/440 MHz transceiver (but usually two), a couple of HTs and assorted batteries, chargers, etc. Moving around the room, you'll find the recording equipment—an electronic keyboard, and a stand for the rhythm composer (what they used to call drum machines before they became so complicated and realistic sounding) recording and processing gear.

All this stuff, when stacked up neatly, is not a problem. The problem is that it seems that everything in the room requires at least two strands of cord or wire to make it operate—one going in and one going out. The transceivers must each have an antenna and microphone. The recording gear must have microphones, as well as a patch cord in between every processor. The packet station and computer have more wire than some Southwestern cattle ranches. To this maze of cable we must add a power cord for each and every piece of gear. Of course, because there is SO much gear, I had to add a few AC terminal strips/surge suppressors, which are nothing more than the independent contractors of the cord world. They don't connect to anything. They're just cords for cords' sake.

Along with this prime shack real estate comes a nice, sizable closet for shack use only. This closet can be walked into. This closet has two rows of shelves lining three sides. This closet has its own separate AC circuit and light switch. This closet is bigger than some of the apartments I've lived in. This closet is entirely, one hundred percent, with not one cubic inch to spare—full. Full, full, full. Full to the very threshold of the closet door—a door which does not close because the fullness is too full and is starting to enter the room (which, as we've already established, is full).

I promised my wife that I wouldn't just throw my shack together haphazardly this time. When we moved into this house, I promised her I would leave the stuff set up on the desk until I could arrange the room into a permanent and pleasing arrangement. I have kept this promise. The room is still set up temporarily. The walls are bare of any posters, charts or maps. The closet is still full of boxes to be unpacked (boxes full of more wires and cords, I'm certain). Antenna wires enter through open windows. The 20 amp power supply is in the same exact spot it was placed on the day we moved in. The only difference is that it now has red and black wires snaking out from behind it.

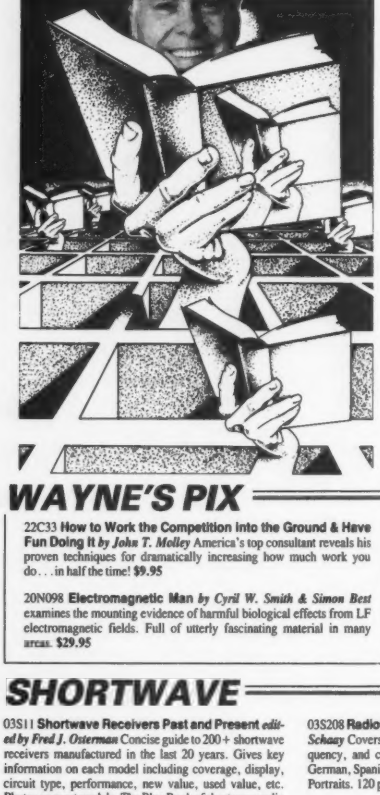
I know my life would be a lot happier if I would take some time to organize my shack. The longer I wait the more difficult it is to begin, because a shack is not a static thing. It is a living, breathing, GROWING entity. It has a life of its own, and the longer you have it, the bigger it gets. A new piece of gear comes in and the box gets thrown on the floor (I'll store that box just as soon as I clean out the closet). A new boom microphone is installed. I'll run those cables neatly next weekend, but right now I'll just leave them where they fall. Look up an address and the *Callbook* gets a new home on top of the stack of other reference books I swore I'd return to the shelf. After all, it's only temporary.

After the "never put anything back where it came from" sickness I suffer from, the other affliction I must confess to having is the dreaded "never throw away a piece of paper" disease. Since I like to keep notes on just about everything, the amount of loose paper displayed in my shack at any one time would probably be a cause of some concern to the local fire marshal. I have pieces of paper with net frequencies (no net names, mind you—just the frequencies). I have pieces of paper with the settings of my antenna tuner for each band of operation and each antenna—even antennas that have been taken down and are currently living somewhere in my closet. I have pieces of paper listing items for sale, obtained from local swap nets and packet bulletin boards. I'm not looking for any new gear, you understand—I simply must write down any potential bargain. I have pieces of paper containing the orbital data of satellites that have long ago burned up in orbit. I have pieces of paper with telephone numbers—no names, just telephone numbers. I have pieces of paper containing directions to places I've never been to and have no intention of ever visiting. Paper grows on my desks and floor like a fungus. I've tried everything—spraying, washing with bleach, dehumidifiers—nothing works. Maybe there's something about RF frequencies that is conducive to yellow legal pad paper growth.

I must admit that there are some positive aspects to my shack's constant state of chaos. I can operate several bands and modes at once. I've often had 2 meter packet, HF RTTY, 440 repeaters and HF sideband all going at the same time. If the muse hits me, I can wade through the snake pit of cables to my 4-track tape recorder and within minutes record a potential hit song for posterity. I have faithfully kept every packing box from every piece of gear of any kind. If anything ever has to be shipped out for repair, I'm prepared (I've been a ham for 20 years and have only had to ship back one HT for repair, but you never know). With all cables and wires exposed, I can change configurations in an instant. Hiding the wires neatly behind the desks and along the baseboards would mean I'd only have to rip them up whenever I wanted to move things around. Since the bookcase is on the opposite side of the room from my operating position, it is more convenient to stack the books on my desk. After all, I'm sure that I'll need to check that WWII-era *ARRL Handbook* again in the near future. Why bother putting it back on the shelf?

Plus...since the bookshelf is now empty...I can bring in a few more books!

Uncle Wayne's BookShelf



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02C30 **The Commodore Ham's Companion** *by Jim Grubbs K9EI* 160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

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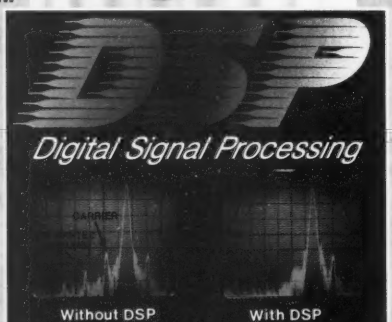

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